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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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Development
of
WATER RESOURCES
in
APPALACHIA

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MAIN REPORT
PART I
SUMMARY REPORT

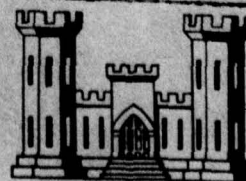
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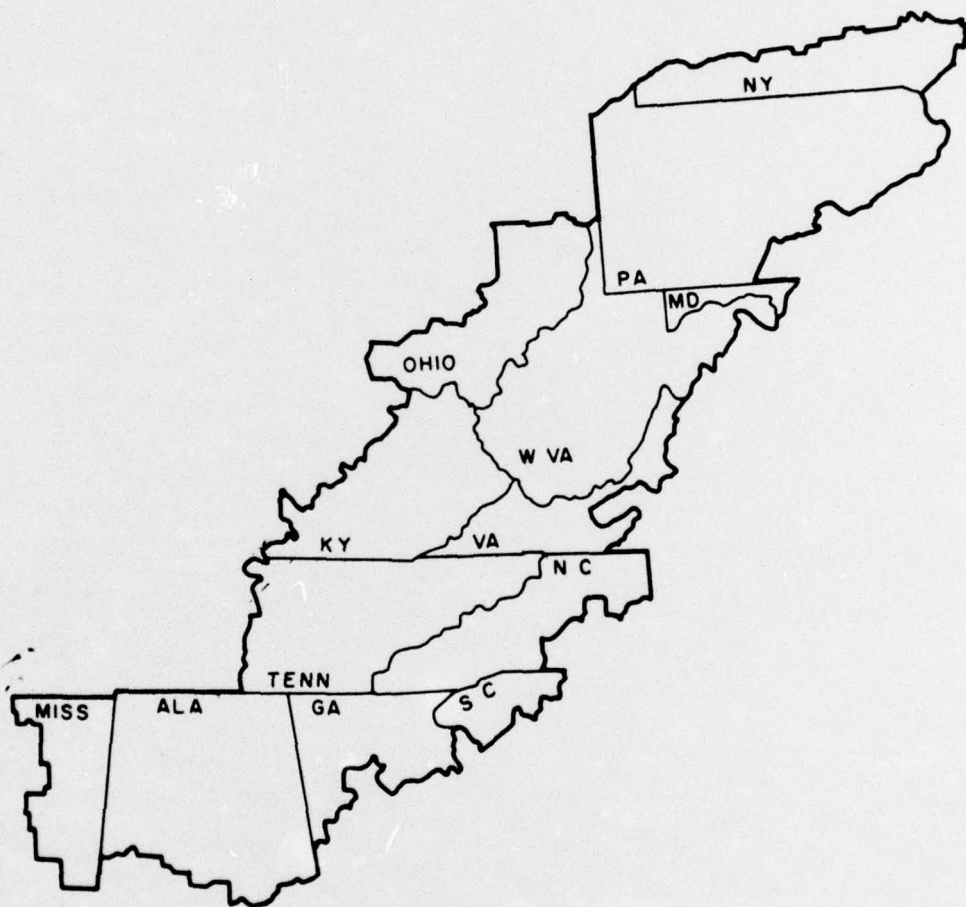
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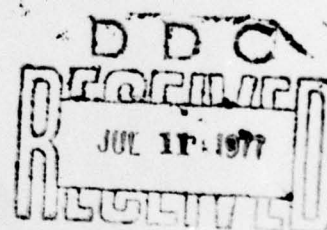
OFFICE OF APPALACHIAN STUDIES



(1)

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
CINCINNATI, OHIO 45201

**DEVELOPMENT
of
WATER RESOURCES
in
APPALACHIA**



December 1969

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Prepared in cooperation with the thirteen Appalachian States; the staff of the Appalachian Regional Commission; the Federal Departments of Agriculture, Commerce, Health, Education and Welfare, Interior and Transportation; the Federal Power Commission and the Tennessee Valley Authority; and with major inputs from the following Corps of Engineers Districts -- Philadelphia, Baltimore, Norfolk, Charleston, Savannah, Mobile, Buffalo, Pittsburgh, Huntington, Louisville and Nashville.

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DEVELOPMENT
OF
WATER RESOURCES IN APPALACHIA

PREFACE

This Appalachian Water Resources Survey was carried out in response to Section 206 of the Appalachian Regional Development Act of 1965 (PL 89-4, March 9, 1965), which states in part:

"Sec. 206. (a) The Secretary of the Army is hereby authorized and directed to prepare a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian region, giving special attention to the need for an increase in the production of economic goods and services within the region as a means of expanding economic opportunities and thus enhancing the welfare of its people, which plan shall constitute an integral and harmonious component of the regional economic development program authorized by this Act."

The plan for water resources development in Appalachia was prepared with federal, state, local, and private agency cooperation. Preparation and supervision of the report was the direct responsibility of the Office of Appalachian Studies (APS), a specially formed group within the Corps of Engineers, operating under the Ohio River Division Engineer. Overall guidance was provided by the Offices of the Secretary of the Army and the Chief of Engineers, and also by the Water Development Coordinating Committee for Appalachia (WDCCA). This committee was comprised of representatives of the thirteen Appalachian governors, the Appalachian Regional Commission, and the appropriate Federal departments and agencies.

In summary, a comprehensive survey of the developmental potential of the water and related resources of Appalachia has been conducted. It is unique in several particulars, especially in that it set regional growth as a principal objective.

Therefore the scope, content, and format of this report are also unusual.

The Summary Report

The Main Report is divided into six Parts. This volume and the folio of maps in Volume 2 comprise Part I, the Summary Report. In this volume are the overall findings, and all pertinent conclusions.

Sub-regional Reports

Volumes 3, 4 and 5 comprise Part II, the Sub-regional Plans. Delineation of the Water Sub-regions requires a word of explanation. The hydrologic diversity and geographic complexity of Appalachia required decentralization of much planning to numerous field offices. Early in the effort, APS recommended, and the WDCCA concurred in, the compartmentalization of the region into ten water sub-regions, basically within major basin boundaries. However, in delineating the water sub-regions, cognizance was given to economic sub-regions (27) developed by the Office of Business Economics of the Department of Commerce, based on trade patterns, and to incorporating whole planning districts (60-odd multiple-county planning districts delineated by the States) into the water sub-regions.

The reader will find in Part II the substance of this survey. For each of the ten sub-regions a pair of chapters has been prepared, with the odd-numbered describing the area "today" -- to 1980 -- and the even-numbered presenting the plan of development, including needs for future studies and project investments after anticipated growth trends begin to be realized.

Project Analyses

Part III of the Main Report comprises the Project Analyses, providing details and evaluations of projects which were developed during the Survey. Individual chapters, 1-20, are found in Volumes 6-11.

ORGANIZATION OF THE REPORT

PART I - THE SUMMARY REPORT Vols. 1 & 2 (Map Folio)

PART II SUB-REGIONAL PLANS 20 Chapters Vols. 3-5	PART III PROJECT ANALYSES 20 Chapters Vols. 6-11	PART IV CONCEPTS & METHODS 10 Chapters Vol. 12	PART V STATE WATER SUPPLEMENTS 13 Chapters Vols. 13-14	PART VI HISTORY COORDINATION & COOPERATION Vol. 15
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Vol.

16 - Agriculture, Forestry and Conservation -----	Appendix A
17 - Power Supply and Requirements -----	" B
18 - The Incidence and Formation of Mine Drainage Pollution -----	" C
19 - Water Supply and Water Pollution Control -----	" D
20 - Economic Base Study -----	" E
21 - Recreation and Aesthetics -----	" F
22 - Fish and Wildlife Resources -----	" G
23 - Ground Water -----	" H
24 - Mineral Industry Resources and Water Requirements -----	" I
25 - Loose Leaf Volume-Errata and Addenda	

Chapter 1 of Part III contains not only an introduction to this part of the report but also an up-dated analysis of the Royalton Dam-Salyersville Area project on the Upper Licking River, Kentucky, which was first submitted in 1967 for review. The original report is now appended as a Supplement to Volume 6.

Chapter 12 of Part III, intended for discussion of projects on the Greenbrier River, West Virginia, has been dropped, for reasons given in Chapter 14 of Part II.

Chapters 17 and 18 of Part III describe two projects developed by the Tennessee Valley Authority on which budgetary action is pending.

Chapters 19 and 20 of Part III describe two projects designed by the Commonwealth of Pennsylvania which have much developmental promise.

Concepts and Methods

Part IV of the Main Report (Volume 12) presents the special evaluation procedures developed for and used in the project analyses (Part III). This discussion also presents several methods that can be employed to analyze the expansion effects (job producing potential) of a water resource investment, but cautions that the methods are undergoing refinement.

State Supplements

A unique feature of this report has been the degree of participation by the States. Each has produced a "Supplement" which describes the state-sponsored programs in water resource development, and outlines goals and preferences for immediate as well as future development. These documents have not only been helpful, but have often proven crucial in preparing plans for regional economic expansion. Volumes 13 and 14 of this report form Part V, the thirteen "State Supplements."

Coordination

The efforts taken by the WDCCA to coordinate the studies are described in Part VI, in Volume 15. It contains a short history of the survey, and discussion of the minutes of the nine WDCCA meetings. These latter are on file in the Ohio River Division offices of the Corps of Engineers. The volume also contains summaries of water laws, policies and programs of the States of South Carolina, Georgia, Alabama and Mississippi, and is thus an extension of Volume X, Appendix J, to the Ohio River Basin Comprehensive Survey Report. Appendix J includes similar summaries for the Commonwealths of Kentucky, Pennsylvania and Virginia and for the States of Illinois, Indiana, Maryland, New York, North Carolina, Ohio, Tennessee, and West Virginia.

The Appendices

The plan for Development of Water Resources in Appalachia is supported by nine appendices prepared by several federal departments and agencies having special interests in natural resources development.

Agriculture

The U.S. Department of Agriculture prepared Appendix A, Agriculture, Forestry and

Conservation (Volume 16), and Supplement B to Appendix F (Volume 21). The former describes an accelerated program of land treatment on private, State and National Forest lands that warrants serious consideration. Appendix A also includes details and data concerning present and recommended acceleration of upstream watershed programs. The latter presents the current plans for recreation investments in the National Forests and summarizes recreational developments in the recommended upstream watershed projects.

Commerce

The Office of Business Economics (OBE) of the U.S. Department of Commerce early undertook an "economic sub-regionalization" of Appalachia, including adjacent SMSAs. Based on historical trends, OBE then estimated national, regional, and sub-regional 50-year trends of population, employment and per capita income. These data are published in Appendix E (Volume 20), along with the "developmental benchmarks" prepared by APS.

Interior

The U.S. Department of the Interior has provided four complete Appendices and major parts of two others. These are:

<u>Appendix</u>	<u>Volume</u>	<u>Title</u>	<u>Major Agency</u>
D	19	Water Supply and Water Pollution Control	FWPCA
G	22	Fish and Wildlife Resources	F&WLS
H	23	Ground Water	USGS
I	24	Mineral Industry Resources and Water Requirements	BOM
		and	
C	18	The Incidence and Formation of Mine Drainage Pollution	CE, FWPCA-BOM
F	21	Recreation and Aesthetics	BOR, USDA

Appendix D provides the basic data on water supply and pollution control needs that are fundamental to much of the report. Several reports from the Public Health Service of the Department of Health, Education and Welfare are also included.

Appendix G presents the views of the Fish and Wildlife Service on the potential of the major projects in Part III.

Appendix H presents, among much valuable data, an innovative method for arranging ground

water supply data directly to compare with surface water availability and costs of storage so that an analyst may quickly identify the water supply alternatives which should receive further investigation.

Appendix I reviews the abundant mineral resources of Appalachia and estimates the requirements, over time, that the extractive industries will pose on the water resources of the Region.

Appendix C displays a joint effort on mine drainage pollution by APS, and FWPCA and BOM. The latter agencies provided much basic data, from files and field investigations, which APS attempted to assimilate. Then, in the Amendments Act of 1967, the Commission itself was directed to conduct a study of acid mine drainage. With an increased budget, the Commission was able to undertake new research and its report supplanted the report APS had intended to make. Appendix C is therefore "Appendix C" to both reports -- a

basic data compilation and certain interpretative notes -- of value both to this report and the submission by the Commission to the Congress.

Finally, among Interior's efforts, is Appendix F in which the Bureau of Outdoor Recreation provides general views concerning the potential of the Region for recreation development, as well as analyses of the recreation potential of most of the projects in Part III.

Federal Power Commission

In Appendix B (Volume 17) is to be found detailed projections of power demand and supply in the near term in Appalachia. Comments on individual projects were supplied by FPC by separate letters, described or reproduced in Part III.

Addenda

The last volume of the report (Volume 25, loose-leaf) contains addenda and errata.

DEVELOPMENT
OF
WATER RESOURCES IN APPALACHIA
PART I
SUMMARY REPORT

CHAPTER 1 - THE SURVEY AND REPORT

1. PURPOSES AND OBJECTIVES

The investigations required to carry out a special survey of water and related resources in the Appalachian Region have been completed, and the plan developed is summarized herein.

Purposes

The purpose of the Appalachian Regional Development Act of 1965 (PL 89-4) is contained in Section 2, which states in part:

".... the purpose of this Act [is] to assist the region in meeting its special problems, to promote its economic development and to establish a framework for joint Federal and State efforts toward providing the basic facilities essential to its growth and attacking its common problems and meeting its common needs on a coordinated and concerted regional basis."

The purposes of the water resources survey embrace two of the most important fields of national policy: economic development and growth, and natural resource conservation and development. These purposes are:

To analyze the water resource potential in Appalachia in relation to the need for accelerated economic development in this region.

To develop a long range plan under which the water resources of Appalachia may be effectively utilized to further the economic and social goals of the region. This plan will require coordination

among Federal, State and local development efforts.

To identify water and related resources investments which may be undertaken immediately or in the near future for the development of Appalachia.

To provide a framework of continuing cooperative relationships for further planning of water resources for Appalachian economic development.

Objectives

Regional economic development, defined as increasing aggregate regional income, is the principal objective of Appalachian water resource planning. Plan and project formulation has been directed toward increasing regional income, which arises from employment of resources within the region and from transfers of income into the region from the nation at large. In response to Section 206(a) of the Act asking that, ".... special attention [be given] to the need for an increase in the production of economic goods and services within the region as a means of expanding economic opportunity and thus enhancing the welfare of its people," the Appalachian Water Resources Survey (AWRS) has focused upon changes in wage and salary components of regional income. *National income gains* are also served through the Appalachian water resources program, principally through the mobilization in the region of un- and under-utilized labor and capital resources. An important component of net regional income gains are those defined as joint national and regional income. A third objective, to *improve the environmental quality* of Appalachia has also been operative, to the extent that environmental quality can be related to regional development.

cont
↓
The environmental goal of the survey is to use water resource projects to correct environmental problems which inhibit economic growth. A preservation strategy plays only a minor role. However, the plan has sought not only to identify environmental resources -- archeological, historical and visual resources -- which may be adversely affected by water resource development (and sought to minimize them), but also to enhance the environment in conjunction with the projects.

Performance indices showing the contributions to the first two of these objectives have been developed for projects recommended for early development.

2. SCOPE OF STUDY

The Region and Its Challenge

↓ Among the regions of the United States, the Appalachian Region holds a strategic position in water resources. The Region consists of 397 counties, in thirteen states. Parts of fourteen major basins and many parts of other basins and major tributaries have their headwaters in Appalachia. (See Figure 1-1). The great populations of the Atlantic Seaboard and the Piedmont, many of the cities of the Ohio and Tennessee Valleys, as well as the growing economies of much of Georgia, Alabama, and Mississippi are dependent on the wise use, control and development of Appalachian water and related resources. No other American geographic region can compare with Appalachia in terms of the number of people or the size of the economy influenced by regional water development plans. As a highland, the water problems of Appalachia are quickly and keenly felt in the Region, but in many instances are soon transferred downstream where their influence may become of even wider significance. Thus the plans for Appalachian resources are of direct concern to many other regions and centers of influence.

→ The strong links which exist between Appalachia and adjoining regions, and ultimately to the nation as a whole, are physical, social and economic. Today the physical, social and economic problems of Appalachia are impairing the ability of the region to meet its own

economic needs and to deliver to the nation the Region's share of the resources required for a healthy national economy. By almost every measure of social and economic attainment, the Appalachian people and the Appalachian economy are below the national average.

In this study the identification of problems and needs, and the resulting conclusions concerning their alleviation, pertain largely to the identified growth centers ~~in~~ within the region. Little attempt has been made to conduct a comprehensive survey of each of the drainage areas in the region, although it is recognized that there are many problems that hamper the progress of their communities. Periodic evaluation of these areas, and problems and needs of communities outside currently identified growth centers, has been included as a part of the plan.

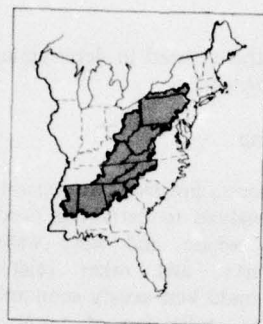
↓ In the identification of needs and the study of alternatives for their resolution, all available data were used and, in some instances, specific additional data were gathered. Studies and designs were carried only to the point where adequate choices could be made, i.e., designs are preliminary in nature or to "survey scope." When projects are authorized and funded, detailed design studies will be required, as is the usual case after project authorization.

3. PLAN DEVELOPMENT

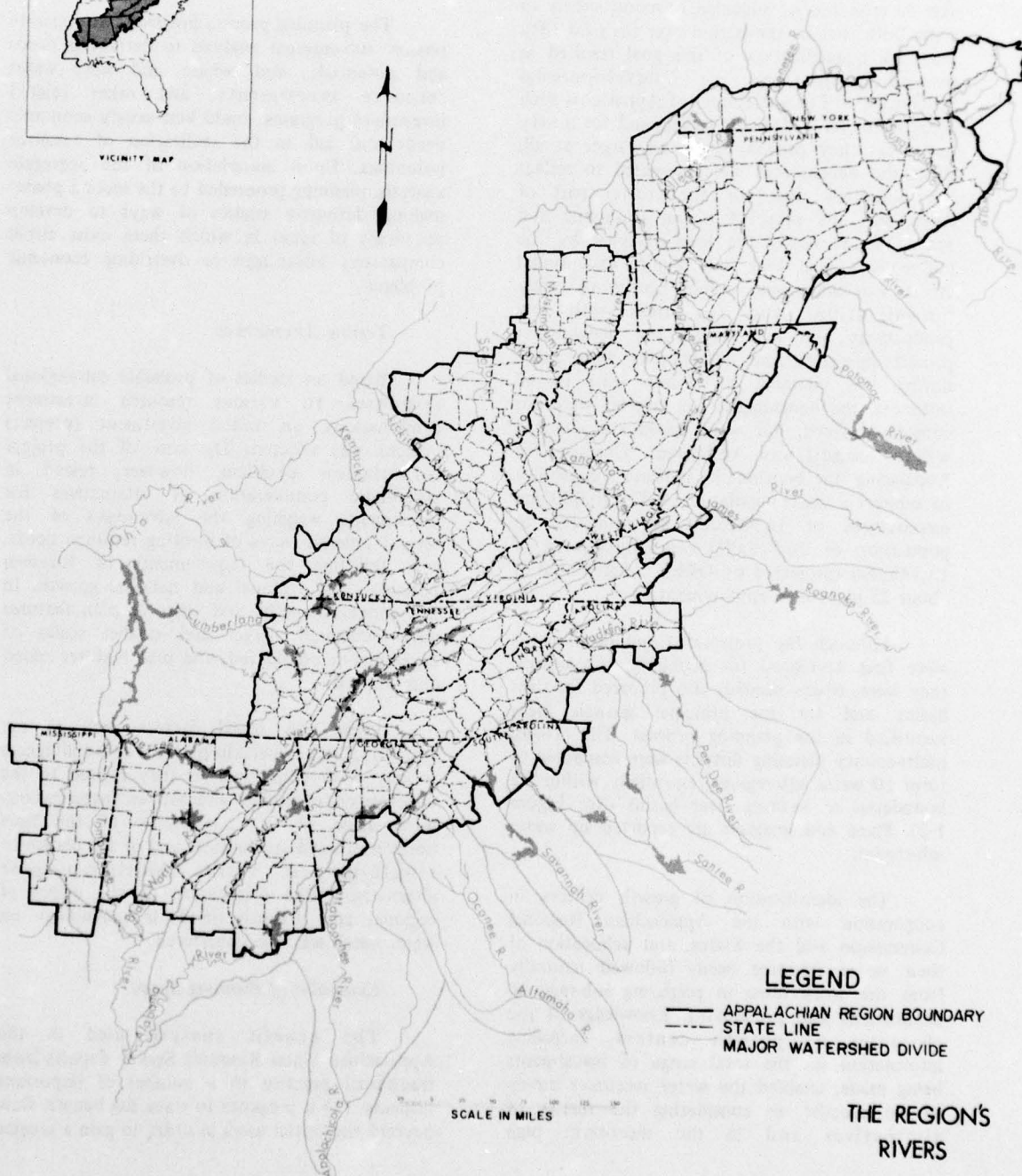
Economic Sub-regions and Water Sub-regions

In order better to understand the economy of Appalachia, economic sub-regions were delineated based on trade and commuting patterns. The Office of Business Economics (OBE) of the Department of Commerce prepared 27 economic sub-regional delineations as well as projections of population, employment, and income for 1980, 2000 and 2020. The projections, although prepared in advance of the present national estimates, were developed to fit the OBE national planning framework.

The projections, based on the historical growth patterns of Appalachia, do not represent an adequate planning goal, since, although they reflect some progress, they also picture a



VICINITY MAP



LEGEND

- APPALACHIAN REGION BOUNDARY
- - - STATE LINE
- MAJOR WATERSHED DIVIDE

SCALE IN MILES

THE REGION'S RIVERS

depressed region, well below the national averages. To provide more meaningful planning objectives, APS made the assumption that the regional economic development efforts would be able to raise the Appalachian economy nearly to a par with that of the nation over the next fifty years. A quantification of this goal resulted in revised projections, or "developmental benchmarks." For some areas of Appalachia such goals were not a difficult target, and for a very few areas they proved to be no target at all; there the benchmarks were increased to reflect the potentials. But for the greater part of Appalachia the prospect of an economic and social life at nearly the level attained by the nation is a goal that will require exceptional effort. For areas with a long history of heavy out-migration, and for areas with low productivity and low wages, the benchmarks proved infeasible and adjustments were made during the planning to reflect this. In all instances, the benchmarks (or targets) were not considered fixed, but were tested and changed where conditions indicated. Overall, for Appalachia, the benchmarks indicate a capability to support a 2020 population of 43,390,000 and employment of 16,532,000 as compared to population of 36,579,000 and employment of 13,145,000 (projected by OBE), a differential of about 25 percent in employment.

Although the projections and benchmarks were first developed for economic sub-regions, they were, where needed, also prepared for river basins and for the principal growth areas identified in the planning process. The 60-odd multi-county planning districts were combined to form 10 water sub-regions, essentially within the boundaries of existing river basins (See Figure 1-2). Plans and analyses are reported by water sub-region.

The identification of growth centers, in cooperation with the Appalachian Regional Commission and the States, and delineation of their water resource needs followed naturally from the work done in preparing sub-regional delineations and projections. Knowledge of the character of growth centers, including information on the total range of investments being made, enabled the water resources survey to be specific in considering the merits of alternatives and in the short-term plan

recommendations. It also assisted in determining the priorities to be assigned.

Phases of Planning

The planning process involved two separate phases: sub-regional analysis to determine needs and potentials, and where and how water resource investments, and other related investment programs, could best satisfy economic needs and aid in the realization of resource potentials. Upon completion of the aggregate analysis, planning proceeded to the second phase: making definitive studies of ways to develop potentials of areas in which there exist either comparative advantages or overriding economic problems.

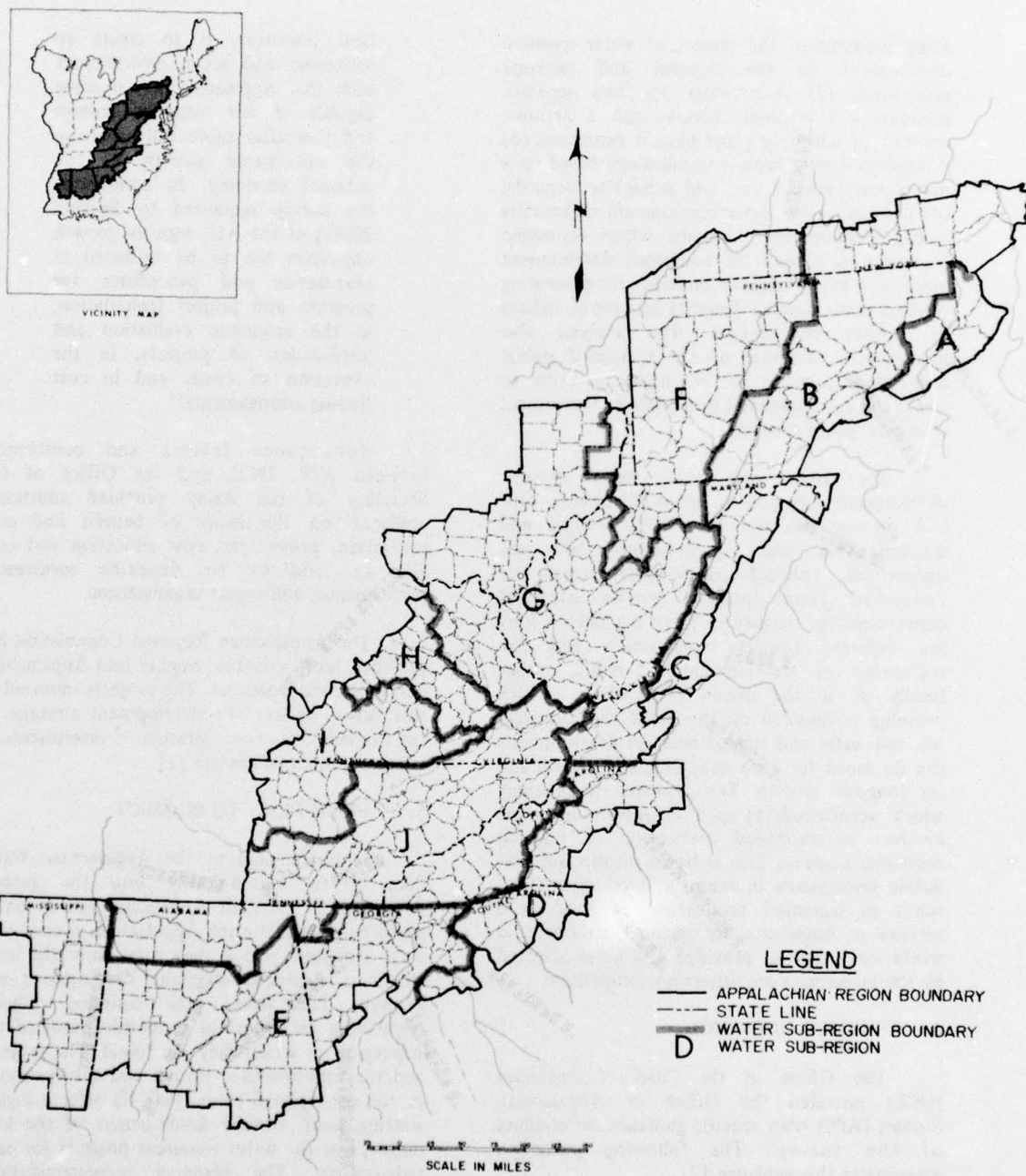
Testing Alternatives

Based on studies of probable sub-regional responses to various resource investment combinations, an initial investment (project) nucleus was selected. The core of the project formulation problem, however, rested in systematic consideration of alternatives for investment, weighing the advantages of the several possible ways of meeting resource needs, and fulfilling the requirements of foreseen potentials for regional and national growth. In this process benefits and costs of plan features were estimated, larger and smaller scales of development considered, and plan features added and omitted.

Legal and social factors such as tax structure, land ownership patterns and willingness to pay were considered as they related to the effectiveness of project alternatives. Investigations were made of the relationship of the time horizon of need satisfaction, and of the choice of single-purpose versus multiple-purpose alternatives. The implication of the effect of regional and national trends in technology on water needs was also considered.

Extension of Planning Scope

The benefit analysis used in the Appalachian Water Resource Survey departs from traditional practice in a number of important respects: (1) it proposes to trace the benefit flow beyond the initial users in order to gain a greater



comprehension of the impact of water resource investment on the regional and national economies; (2) it provides for two separate accounts - a regional account and a national account in which to place benefit estimates; (3) it suggests a new benefit terminology based on a distinction between user and expansion benefits; (4) it provides for the apportionment of benefits among development programs where economic expansion is a result of combined development plans; and (5) it suggests methods for presenting regional and national benefits in several indices of project performance. The analysis also incorporates estimates of the associated public and private costs to be undertaken in order to attain the developmental potentials of the project elements recommended.

The critical role which water resource development may play in economic development and growth has not been well studied and documented, and is, therefore, not well understood. Although considerable growth has followed from public works planned conventionally, frequently there has been a long lag between project construction and the realization of developmental benefits, either locally or to the nation as a whole. AWRs planning is founded on the belief that properly selected water and related resource developments can do much for early economic stimulation and for long-run growth. The approach to planning which accommodates such extensions in scope involves an expanded application of regional economic analysis. This is based on the fact that public investments in resource development can result in increased production of goods and services in Appalachia for regional, national and world consumption provided the areas affected by the investment are otherwise competitive.

4. SURVEY GUIDANCE

The Office of the Chief of Engineers (OCE) provided the Office of Appalachian Studies (APS) with specific guidance for conduct of the survey. The following paragraph summarizes this guidance [2].

"The primary objectives of the economic development program for Appalachia, including the further development and utilization of its water and related

land resources, is to create an economic and social environment such that Appalachia may become capable of self sustained growth and thereafter more fully share in the anticipated growth of the national economy. In conducting the survey requested by Section 206(a) of the Act, regional growth objectives are to be reflected in standards and procedures for program and project formulation, in the economic evaluation and justification of projects, in the allocation of costs, and in cost sharing arrangements."

Subsequent letters and conferences between APS, OCE, and the Office of the Secretary of the Army provided additional guidance on the issues of benefit and cost evaluation, projections, cost allocation and cost sharing, indices to describe investment performance, and report organization.

The Appalachian Regional Commission has provided most valuable insights into Appalachian developmental potential. The projects reported in this survey reflect the development strategy of the Commission - concentration of investments in selected economic centers [1].

5. FROM PLAN TO PROJECT

It is the goal of the Appalachian Water Plan to fit harmoniously into the general development plans for Appalachia and in doing so to help stimulate the Appalachian economy in such a manner that it may soon enter the main stream of American economic development and growth. The water plan contains projects responding to important economic needs of the sub-region in which they are found. The projects and the recommended studies and surveys found in the sub-regional plans (Part II) offer a logical starting point toward development of the long range plans for water resources projects for each sub-region. The planning recommendations establish a system of priorities for Appalachian water resource development related to the rate at which growth center needs are developing. Projects for early action are separated from those identified as needed in the longer run.

References:

- [1] The terminology of "growth centers" throughout this report should be construed also as meaning "growth nodes" or "economic activity areas" as such terms are used in the individual Appalachian States. See Figure 2-9, page I-2-26, for designations.
- [2] The two guidance letters were published in the *Plan of Survey for Development of Water Resources in Appalachia*, Office of Appalachian Studies, Cincinnati, Ohio, February 1966, Exhibits 10a and 10b.

CHAPTER 2 - APPALACHIA - PAST, PRESENT, AND POTENTIAL

1. PHYSICAL AND DEVELOPMENTAL BACKGROUND

The Extent of Appalachia, and Its Problems

The Appalachian Region consists of about 195,000 square miles, or 125,000,000 acres, of generally mountainous terrain extending southwesterly from the southern part of New York State to central Alabama, northwestern Georgia and northeastern Mississippi. The region includes 397 counties located in portions of the States of New York, Pennsylvania, Ohio, Maryland, Kentucky, Virginia, Tennessee, North

Carolina, South Carolina, Alabama, Georgia, Mississippi, and all of West Virginia. The region is larger than California in size, and has a population of over 18 million. It is located between two of the most urbanized and highly industrialized regions in the world - the Atlantic megalopolis on one side and the industrial Midwest on the other.

The three major sectors in the Appalachian economy - agriculture, mining, and primary manufacturing - have brought common problems to all the region. Appalachia specialized in the extraction of its rich resources until a time when shifting markets and changing technology have



The Blue Ridge Parkway and the Mountains of North Carolina

drastically reduced employment in agriculture and mining. Between 1940 and 1960, Appalachia lost 680,000 jobs in these two sectors. This employment loss was offset by increases of about 690,000 jobs in manufacturing, although regional manufacturing did not increase as rapidly as manufacturing in the nation. Although considerable diversification is appearing in parts of Alabama, Tennessee, Ohio, Maryland and New York, most of the major parts of Appalachia possess dangerously specialized, nearly single-purpose economies, whether one considers isolated towns in Eastern Kentucky, or large industrialized cities such as Pittsburgh or Birmingham. Appalachian service sector employment remains 10 percent less than that of the nation. Appalachia's population traditionally migrates to opportunity outside the region, although this trend is diminishing.

The mountains are one common bond among the various parts of the Appalachian region. They make it a single province, a barrier between seaboard America and the Mississippi basin. Poverty and isolation are also common bonds among most of Appalachia's counties. Many of the Scotch-Irish, who immigrated in the early 1700's, settled in isolated farmsteads, avoiding the colonial government that did not wish them to go beyond the mountains. Isolated from the flow and influence of national commerce, their physical isolation over the generations became cultural isolation, and finally economic isolation.

The Four Appalachias

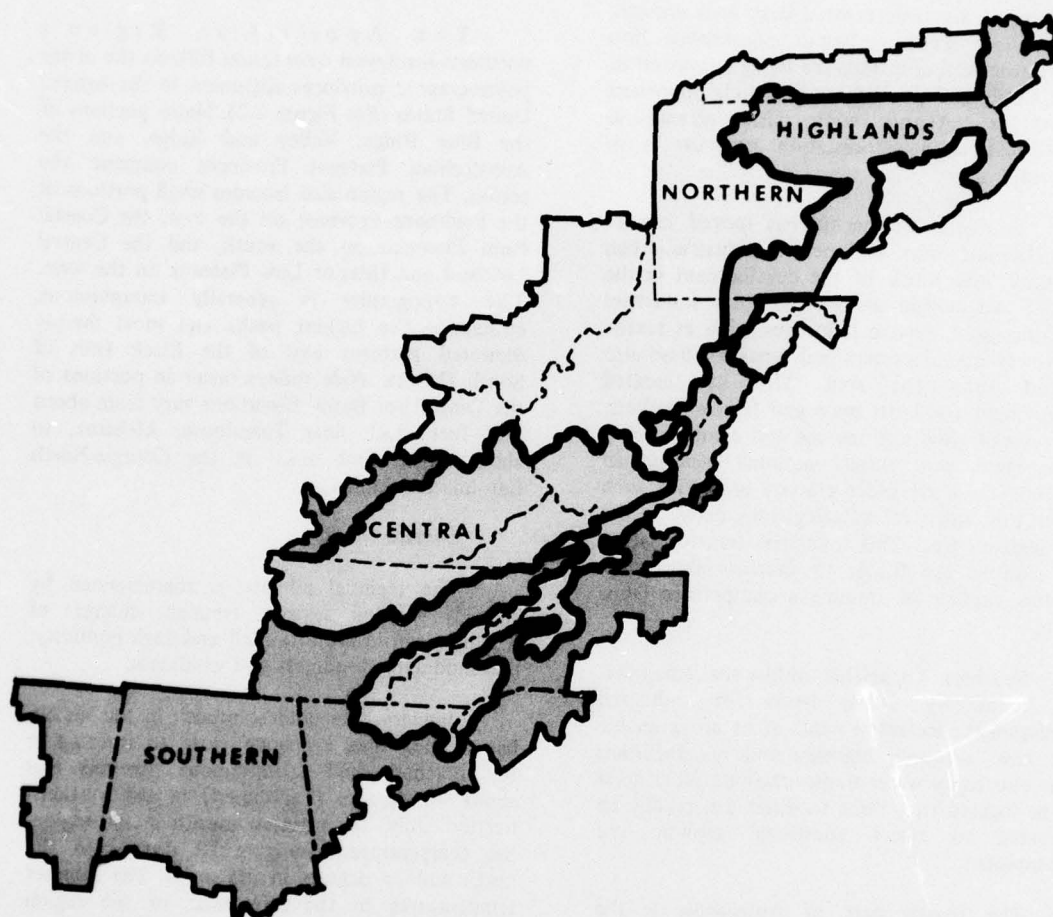
For understanding the Appalachian Region it may be thought of as divisible into four separate developmental entities: Northern Appalachia, Central Appalachia, Southern Appalachia, and the Appalachian Highlands. Many problems are common to all these areas, but each area has different economic development potential. These areas are shown on Figure 2-1.

Northern Appalachia, shown in yellow, was early identified with the nation's industrial development. The area has benefited from extraction of coal and iron deposits, along with the early development of water transportation and railroads. Early industrialization in this area

centered around iron and steel production and related industries. The national transition from coal-steel-railroad industries to new types of manufacturing and service industries has brought many problems. The cities of the area, frequently single-industry oriented, have grown old, and large sections need renewal. Where coal mining has occurred, there are problems caused by mine subsidence, underground fires, strip mining erosion, and mine drainage pollution of stream flow. Throughout the area there are problems of frequent flooding and inadequate water supply for both municipal and industrial purposes. Steel production and coal mining have left massive piles of slag and waste, some burning.

The Central Appalachian area, shown in brown on Figure 2-1, is rural, yet heavily populated with about 1.5 million people. It has a population density greater than that of the United States as a whole, but only in this decade has it developed six communities in excess of 10,000. It has rugged topography, with narrow valleys and steep, wooded hillsides, making it extremely expensive to develop an adequate transportation system. Central Appalachia has problems of inadequate water supplies, sewage treatment and disposal systems for rural and urban areas, inadequate school systems and hospitals, and minimal health services. All of this area is underlain with coal. Many new mines, and operating older mines, are highly mechanized and require few, but highly skilled workers. Strip mining operations have created an urgent need for land reclamation. Because of the topography, farms are small, and much land is eroded due to poor farming practices. There is little manufacturing activity. The states in Central Appalachia have developed and are developing plans for access highways, new high school and post-high school vocational and technical education facilities, and better facilities for primary and secondary schools. Improvement of these facilities may well attract new industry.

Southern Appalachia is shown in blue on Figure 2-1. Many settlers in Southern Appalachia produced turpentine and tar from the pine forests covering the region. As need for these naval stores subsided, forests were cut and the land was converted to farming. For many years, cotton and tobacco production in this area were the main farming activities. Continued planting



THE FOUR APPALACHIAS

FIGURE 2-1

of these crops, however, along with lack of conservation practices, created large scale erosion. Small farms are now being consolidated into large farms, and croplands are being converted to grass. Cattle and poultry are becoming important industries. Along with this agricultural transformation, a reforestation program is in progress.

Southern Appalachia has moved rapidly from farming into a dispersed industrial-urban economy with much of the development in the apparel and textile sectors. As these industries have increased, service industries, such as textile machinery manufacturers and repairers, have also moved into the area. This has created employment for both male and female workers, and rates of growth in income and manufacturing employment now exceed national averages. In addition, there are older primary industries, such as the iron and steel industry, long active in the Birmingham area. This industrial transformation has required the States to develop educational systems capable of training a competitive labor force.

Southern Appalachia, unlike the remainder, has relatively ample lands for industrial development. Extensive land areas are available that have adequate highway and rail facilities; some also enjoy water transportation. Other areas are so located that these facilities can readily be provided to foster additional growth and development.

The fourth part of Appalachia is the Highlands area, the green area on Figure 2-1. It includes considerable state and federal land holdings in and near Allegany State Park and the Catskills areas of the Appalachian plateau in New York State, the Poconos and Allegheny ridges of Pennsylvania, the Deep Creek area in Maryland, the Black Water Falls-Seneca Rocks-Smoke Hole country of West Virginia, the Blue Ridge and Smokies of Virginia, North Carolina, and Tennessee, and the Chattahoochee National Forest of northern Georgia. The area is sparsely populated, heavily timbered, and has long been considered a national scenic resource as well as a prime recreation, conservation, and tourist area. Little, if any, industrialization exists.

Physiography and Topography

The Appalachian Region's northeast-southwest orientation follows the major physiographic provinces alignment in the eastern United States (See Figure 2-2). Major portions of the Blue Ridge, Valley and Ridge, and the Appalachian Plateaus Provinces comprise the region. The region also includes small portions of the Piedmont Province on the east, the Coastal Plain Province on the south, and the Central Lowland and Interior Low Plateaus on the west. The topography is generally mountainous, containing the highest peaks and most sharply dissected plateaus east of the Black Hills of South Dakota. Wide valleys occur in portions of the Ohio River Basin. Elevations vary from about 100 feet m.s.l. near Tuscaloosa, Alabama, to about 6,700 feet m.s.l. in the Georgia-North Carolina mountains.

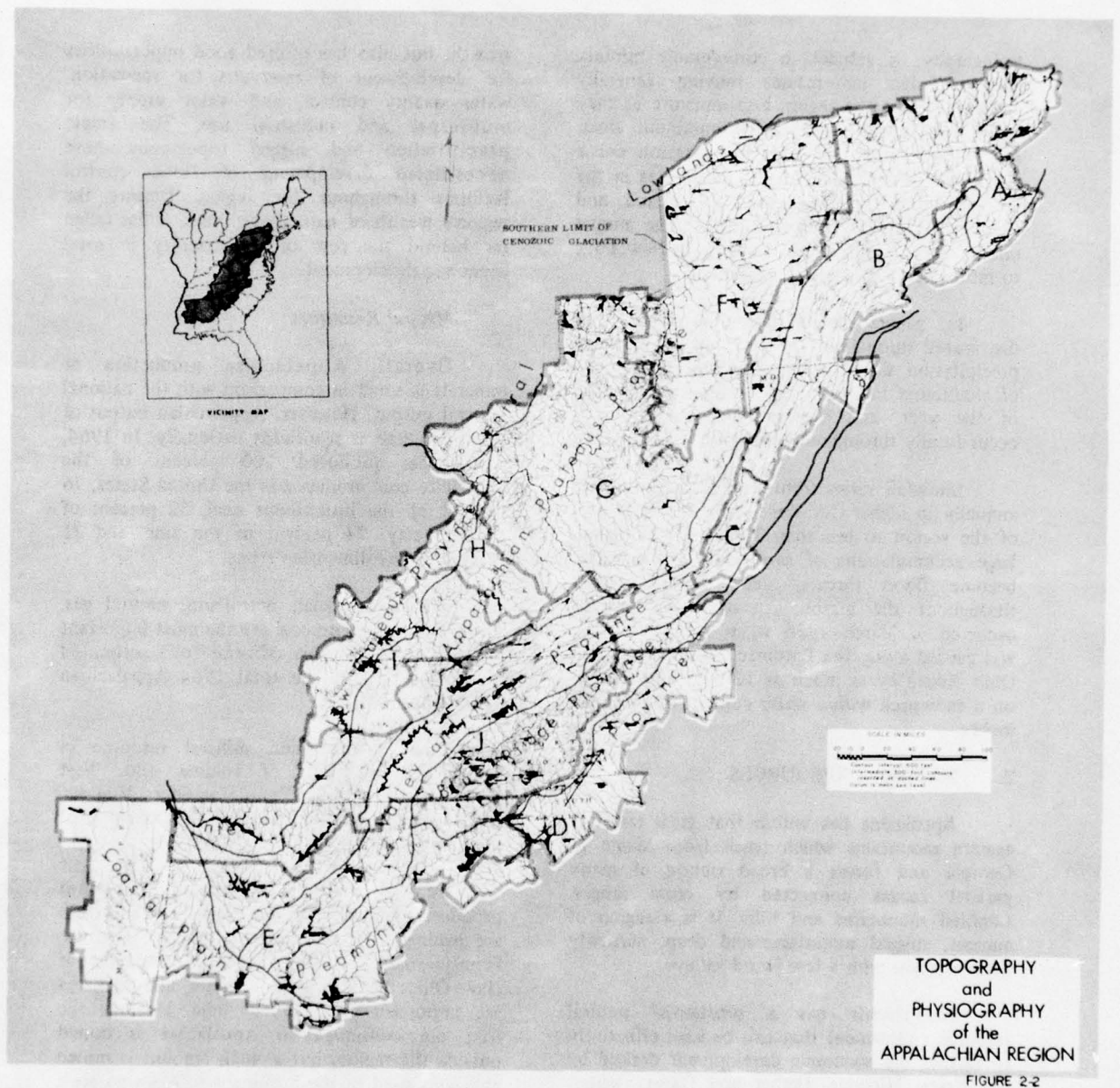
Climate

The regional climate is characterized by strongly marked seasons, frequent changes of weather, considerable rainfall and high humidity, and moderate cloudiness and windiness.

January, the coldest month in the region, has temperatures averaging close to freezing in the northern and mountainous portions and about 40 degrees (Fahrenheit) in the southern portion. July, the warmest month in the region, has temperatures averaging 70 degrees in the north and 75 degrees in the south. The summer temperatures in the mountains of the region average 10 degrees lower, with related lower humidities, than those of the lower plains. This factor is highly conducive to recreation development.

Tropical storms are not as destructive in the region as along the coasts because those that penetrate the area have already lost much destructive energy. However, they do sometimes introduce heavy rains which produce severe floods often involving loss of life.

The region, situated as it is in the path of prevailing winds and major storm tracks of the eastern United States, together with its



topography, is subject to considerable rainfall. Moisture-laden air masses moving generally eastward across the region lose moisture as they are forced upward over the mountainous areas. As a result, areas of high precipitation occur along the western side of the mountains in the headwaters of the Tennessee, Cumberland, and some other Ohio River tributaries. The annual rainfall varies from about 35 inches in New York to more than 55 inches in Alabama.

In general, precipitation is fairly well distributed throughout the year, yet the monthly precipitation shows much variation. Local rains of cloudburst intensity may occur at any season of the year, and occasional serious droughts occur locally throughout the region.

Snowfall varies from more than 100 inches annually in higher elevations in the northern part of the region to less than 3 inches in Alabama. Large accumulations of snow only occasionally become flood threats, since melting occurs throughout the season. An exception to this occurred in March 1936 when record flooding was caused along the Potomac, Susquehanna and Ohio Rivers by as much as 12 inches of rainfall on a snowpack with a water content of about 10 inches.

2. NATURAL RESOURCES

Appalachia lies within that great range of eastern mountains which reach from Maine to Georgia and forms a broad ribbon of many parallel ranges connected by cross ranges, tumbled mountains and hills. It is a region of ancient, rugged mountains and deep, narrowly defined coves with a few broad valleys.

Appalachia has a substantial natural resource endowment that can be used effectively to further the economic development desired by the states. Minerals, timber and forests, water, agricultural land, scenery, and wildlife are the basic natural resources available.

Appalachia harbors abundant mineral deposits, and forests cover about 62 percent of its area, with much of the timber again becoming merchantable. The average annual precipitation is plentiful and well above the national average. This has not only made for abundant forest

growth, but also has offered good opportunities for development of reservoirs for recreation, water quality control, and water supply for municipal and industrial use. The ample precipitation and rugged topography have necessitated development of flood control facilities throughout the region. Despite the region's wealth of natural resources, it has fallen far behind the rest of the country in total economic development.

Mineral Resources

Overall, Appalachian production of minerals is small in comparison with the national mineral output. However, Appalachian output of a few minerals is significant nationally. In 1964, Appalachia produced 100 percent of the anthracite coal produced in the United States, 76 percent of the bituminous coal, 52 percent of the fire clay, 24 percent of the zinc, and 21 percent of the dimension stone.

Bituminous coal, petroleum, natural gas, stone, and anthracite coal are the most important minerals to Appalachia. Mineral fuels accounted for 79 percent of the total 1964 Appalachian mineral output.

Coal is the main mineral resource in Appalachia in terms of volume sold. West Virginia, Pennsylvania, Kentucky, Ohio, Virginia, Alabama, and Tennessee are the major coal producing states.

Pennsylvania and Ohio are important producers of crushed stone. New York and Ohio are leading sand and gravel producers. Georgia, Pennsylvania, and Ohio are top producers of clay. Ohio, Pennsylvania, Virginia, and Alabama are important producers of lime. Most of the iron ore consumed in Appalachia is mined outside the region, but a small amount is mined and consumed in the Birmingham, Alabama area. The Ducktown district in Tennessee is the only copper producing area in Appalachia. Tennessee also produces 24 percent of the nation's zinc (1964).

In 1964, petroleum and natural gas production in Appalachia had a value of \$187 million, which was only 1.7 percent of the U.S. total. Petroleum and gas fields are found in all

parts of Appalachia except the Carolinas and Georgia. The most extensive fields with the greatest production are located in Pennsylvania, West Virginia, and Kentucky.

Other important minerals in the region are: shale, kaolin, dolomite, marble, feldspar, mica, talc, gypsum, salt, and brine. A more detailed discussion of the mineral resources is provided in Appendix I, Mineral Industry Resources and Water Requirements, and in Appendix C, The Incidence and Formation of Mine Drainage Pollution.

Water Resources

Water is abundant in Appalachia. The average annual precipitation for the region is about 47 inches, although in some of the mountainous areas of the southern portion it reaches 60 to 80 inches, of which about 40 percent is carried away by the streams. Higher stream flows are generally experienced during the winter months. There are about 6.4 million acres along Appalachian streams subject to flooding, and on about 35 percent of this flood plain area flooding occurs several times a year. Severe urban damages are infrequent because the heavily populated areas are provided with moderate degrees of flood protection through existing improvements. However, in Central Appalachia and other parts of the Region where topographic restraints are severe, strip communities have been built on the frequently inundated flood plains, because they are the only developable lands. In most rural areas from 70 to 80 percent of the flood plain area is in agricultural use. Exceptions to this occur in Alabama, Georgia, and Pennsylvania, where much of the upland is suitable for cultivation, and only about 40 percent of the flood plains has been cleared for agricultural use.

Control and quality improvement of Appalachian water for domestic, industrial, agricultural and recreational needs in and adjacent to the region should aid greatly in the improvement of economic conditions. Appalachian water supply will become increasingly important in meeting the needs of areas adjacent to the region, particularly in the congested urban areas along the Atlantic coast and to the west of Appalachia. With planning

and management, Appalachia can supply all the foreseeable domestic and industrial needs in and adjacent to the region. More than 150 billion gallons of water (230,000 cfs) flow from Appalachia daily; two-thirds of this flow is carried in three major stream systems: the Ohio (including the Tennessee), Susquehanna and Alabama Rivers. The remaining flow is carried in 11 major stream systems and a few minor tributaries of the Great Lakes.

The 14 major stream systems draining Appalachia are the Genesee, Delaware, Susquehanna, Potomac, James, Roanoke, Yadkin-Pee Dee, Santee, Savannah, Altamaha, Apalachicola, Alabama, Black Warrior-Tombigbee, and the Ohio Rivers. (See Figure 1-1, p. 1-1-3.) Most streams draining the region originate within its boundaries. More than half of the Ohio River Basin is in Appalachia.

As an illustration of the amount of water available, if seasonally regulated, to serve the domestic and industrial needs, the Susquehanna River at Sunbury, Pennsylvania has an average discharge of 25,460 cubic feet per second which is equivalent to about 16 billion gallons per day, enough to supply a population of 81 million people; the Kentucky River at Lock 10 near Winchester, Kentucky has an average discharge of 5,185 cubic feet per second or approximately 3.3 billion gallons per day, which would supply the needs of about 22 million people. Of course, without storage, the normal low flows could dependably support many fewer people.

Ground water supplies vary largely with the geology of the region. The Blue Ridge Province has the smallest supply of ground water in Appalachia, with yields seldom more than 15 gallons a minute from a single well. This is hardly sufficient to dependably support small commercial or even domestic needs. In the Piedmont Province, in contrast, the yield from limestone, marble, and other carbonate rocks provides several hundred to several thousand gallons per minute. However, in spite of the excellent general data in Appendix H, less than 25 percent of the counties in the Region have detailed ground-water resources data from the going program of cooperative studies, and at least 25 percent have no data available. Therefore, for the best planning of water resources, the current

groundwater studies program should be continued or expanded to furnish the required information.

Average annual sediment loads in the streams of the region range from 20 tons to about 3,000 tons per square mile. The wide variation in sediment load is caused by differences in climatic factors and land use. Smallest average sediment loads appear where watersheds are heavily forested or improved land treatment measures have been installed; highest sediment loads occur where mining, urban and industrial growth, or sparse vegetative cover are present. Except for a few rivers in the region that derive their sediment largely from channel material, most of the sediment is delivered to the stream system by rapid runoff from storm rainfalls. As a result, about 39 percent of the annual load is transmitted in the maximum month of runoff, and about 14 percent on the maximum day each year.

Many areas, principally in the upper reaches of tributary streams, have surface water of good quality. The quality of surface waters over a large part of the area has deteriorated to various degrees from natural mineralization and pollution by mine drainage, sediment, municipal wastes, and other industrial wastes. The quality of ground water varies from poor to good, and is also subject to mineralization or to contamination from mine drainage, other industrial, and domestic wastes. Additional information concerning quality of streamflow is contained in Appendix D, Water Supply and Water Pollution Control.

Timber and Forest Resources

Appalachia has more forest and woodland than any other area of comparable contiguous size in the nation. About 74 million acres are forested. About one-half of the region's counties are 60 percent or more forested. Much of this forest land produces commercial timber, high quality water, recreation, and fish and wildlife. The United States is not endowed with a surplus of forest land. Merely one-third is forested and only one-quarter of this amount consists of commercial forest land. Appalachia is nearly one-third effectively forested, which can contribute greatly to regional and national

development. More detailed information is contained in Appendix A, Agriculture, Forestry and Conservation.

Agriculture

Because of the scarcity of land suitable for mechanized farming, agricultural development in Appalachia has been limited. The numbers of farms, farm families, and farm employees have declined steadily in the last 20 years. Much of



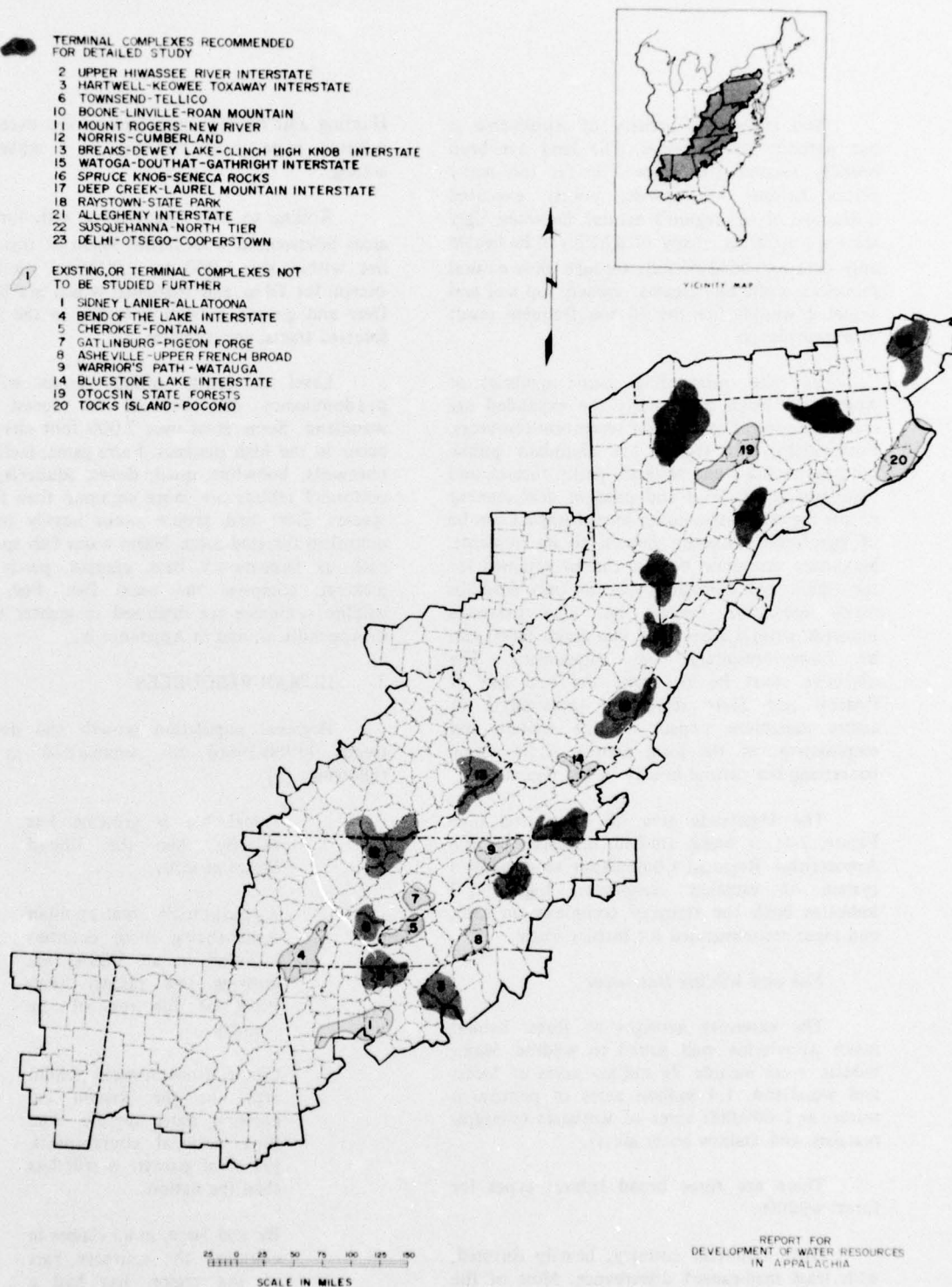
Farming in Eastern Kentucky

the farming in the region is done on small isolated tracts, often on steep, rough terrain, which cannot be efficiently farmed with modern implements.

Scenic Beauty and Outdoor Recreation

The scenic beauty of Appalachia is often outstanding and is a major asset for the region's future. Verdant forests cover coves, plateaus, and mountains. Hardwood trees predominate, but in many areas evergreens grow in sufficient numbers to add contrast that heightens the natural beauty. This land of forested mountains is exquisite in the flowering spring, cool in summer, and extremely colorful in autumn. No area in the United States offers a greater ecological variety of plants. Areas of unique vegetation occur in almost every state in Appalachia. The stretches of woodlands, the clustered mountains, and the lowland vistas are further enriched by the fields, natural meadows, and pastures of the highland farms. Man's works, such as split rail fences and weathered barns and cabins, add to the charm.

- TERMINAL COMPLEXES RECOMMENDED FOR DETAILED STUDY**
- 2 UPPER HIWASSEE RIVER INTERSTATE
 - 3 HARTWELL-KEOWEE TOXAWAY INTERSTATE
 - 6 TOWNSEND-TELLICO
 - 10 BOONE-LINVILLE-ROAN MOUNTAIN
 - 11 MOUNT ROGERS-NEW RIVER
 - 12 NORRIS-CUMBERLAND
 - 13 BREAKS-DEWEY LAKE-CLINCH HIGH KNOB INTERSTATE
 - 15 WATOGA-DOUTHAT-GATHRIGHT INTERSTATE
 - 16 SPRUCE KNOB-SENECA ROCKS
 - 17 DEEP CREEK-LAUREL MOUNTAIN INTERSTATE
 - 18 RAYSTOWN-STATE PARK
 - 21 ALLEGHENY INTERSTATE
 - 22 SUSQUEHANNA-NORTH TIER
 - 23 DELHI-OTSEGO-COOPERSTOWN
- EXISTING, OR TERMINAL COMPLEXES NOT TO BE STUDIED FURTHER**
- 1 SIDNEY LANIER-ALLATOONA
 - 4 BEND OF THE LAKE INTERSTATE
 - 5 CHEROKEE-FONTANA
 - 7 GATLINBURG-PIGEON FORGE
 - 8 ASHEVILLE-UPPER FRENCH BROAD
 - 9 WARRIOR'S PATH-WATAUGA
 - 14 BLUESTONE LAKE INTERSTATE
 - 19 OTTOCIN STATE FORESTS
 - 20 TOCKS ISLAND-POCONO



REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA

TERMINAL RECREATION COMPLEXES

OFFICE OF APPALACHIAN STUDIES

AUG. 1968

The superlative scenery of Appalachia is not without its blemishes. The land has been brutally treated and ignored in far too many places because of unwise, poorly executed utilization of the region's natural resources. Ugly scars are apparent, many of which can be healed only over extended periods through slow natural processes. Polluted streams, eroded top soil and depleted wildlife are the all too frequent result of improvidence.

Yet the outstanding scenic qualities of Appalachia make appropriate the expanded use and development of outdoor recreation resources. Fortunately this region has abundant public holdings in State and National parks, forests, and recreation areas. Wise and prudent development of the region for maximum tourist impact can be of significant economic benefit to its residents. Maximum economic benefit can be attained for the region with a program that not only develops major recreation centers but also preserves immense natural areas. The two major facets can be complementary, not antagonistic. The objective must be to make the best use of Federal and State recreation investments to assure maximum impact on the welfare and employment of the local people, while wisely conserving the natural beauty of the region.

The Highlands area of Appalachia (See Figure 2-1) is being studied intensely by the Appalachian Regional Commission to develop a system of vacation complexes. Figure 2-3 indicates both the terminal complexes *in toto*, and those recommended for further study.

Fish and Wildlife Resources

The extensive acreages of forest habitat make Appalachia well suited to wildlife. Major habitat areas include 74 million acres of forest and woodland, 1.4 million acres of permanent water, and 600,000 acres of wetlands (swamps, marshes, and shallow water areas).

There are three broad habitat types for forest wildlife:

High mountain country, heavily forested, with least man-caused disturbance. Most of the area is above 3,000 feet and is well suited for black bear, wild turkey, and white-tailed deer. The streams contain trout and small-mouth bass.

Hunting and fishing opportunities are excellent, offering prize game and fish in a wilderness setting.

Rolling to hilly topography with forested areas interspersed with farms. Much of this type lies within the 1,000 to 2,000-foot elevation except for Ohio and Alabama, which are lower. Deer and grouse, as well as turkey in the larger forested tracts, are common.

Level to gently rolling terrain with a predominance of openland vs. forest and woodland. Some areas over 2,000 foot elevation occur in the high plateaus. Farm game, including pheasants, bobwhite quail, doves, squirrels, and cottontail rabbits are more common than forest species. Deer and grouse occur largely in the unbroken forested areas. Warm water fish species, such as large-mouth bass, crappie, perch and pickerel, comprise the usual fish. Fish and wildlife resources are discussed in greater detail in Appendix G, and in Appendix A.

3. HUMAN RESOURCES

Regional population growth and density trends (1960-1966) are summarized in the following: [1]

Appalachia is growing less rapidly than the United States *in toto*.

Appalachia's metropolitan areas (being those counties included in an SMSA) are growing less rapidly than those of the rest of the country.

Counties not in metropolitan areas in the Region are growing more rapidly than their national counterparts, yet total growth is still less than the nation.

By and large, in all classes in counties, the southern part of the region has had a stronger growth record than the northern.

Close to half of the Region's total population growth has been in moderately urbanized counties, both in the South and North.

In the northern part of the region, the moderately urbanized counties are virtually the only ones showing growth.

Pattern of Population Growth and Income

That Appalachia is growing less rapidly than the rest of the nation is abundantly demonstrated in Table 2-1 and Figure 2-4 (Pages 2-12 and 2-13). Table 2-2 (Page 2-14) further displays the record of less than national population growth in Appalachia.

Total population in Appalachia is now (1968) increasing at an annual rate of 0.7 percent, while the national population is increasing at a rate of 2.7 percent. A net of almost 2.5 million people left the Region during the 1950's. During 1960-1965, the largest out-migration (in absolute terms) flowed from northern Appalachia, around Pittsburgh. The largest out-migration, in the same period, relative to population size, has been from Central Appalachia, particularly eastern Kentucky. Appalachian portions of three states (Kentucky, Pennsylvania, West Virginia) lost population



"Left Behind"

during 1960-65. The three states with the largest percentage population increase during the same period were Maryland, Mississippi, and Georgia.

From 1960 to 1966, total U.S. population increased 9.8 percent, while Appalachia experienced a net out-migration of 624,700 people. Sixty-three counties, of Appalachia's 397, had a larger increase in population than the national average; 25 of the 63 were in Alabama and Tennessee, and 49 were in the southern urban crescent. It is clear from this that the southern part of Appalachia is growing fastest; and with 10 counties growing faster than the national average in the north, northern Appalachia contains parts that are also growing. Three-fourths of the counties that exceeded the national population growth average were those with small cities, ranging in size from 2,500 to 25,000 citizens.

While per capita incomes in the region have increased, the increase has not been sufficient to bring the region to national per capita income levels. Per capita personal income in 1959 ranged from a low of \$924 in Appalachian Kentucky to a high of \$2115 in Appalachian Maryland. In 1966, the range was from \$1378 to \$3136, with both states occupying the same rank (last and first respectively). Appalachian Maryland surpassed the U.S. 1966 average per capita income of \$2963. The per capita income gap between residents of metropolitan areas in the U.S. and Appalachia was \$265 in 1959, while in 1966 the gap was \$471. In non-metropolitan counties (ranging from rural to 50,000 urban population), Appalachian per capita income was \$326 less than non-metropolitan U.S. in 1959, and \$298 less in 1966. This indicates that large Appalachian urban centers are not keeping up with other large U.S. cities, and that small and medium size Appalachian cities are slowly closing the income gap. The exception to the above occurs in Georgia, Ohio, and Tennessee where counties in the medium and larger non-metropolitan classes have the greatest per capita income and highest rate of increase.

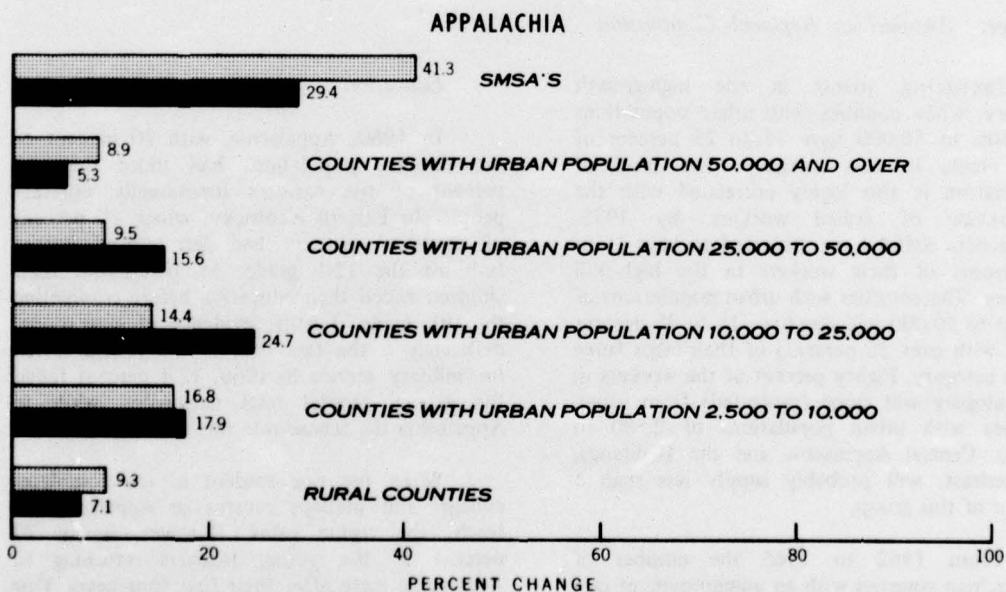
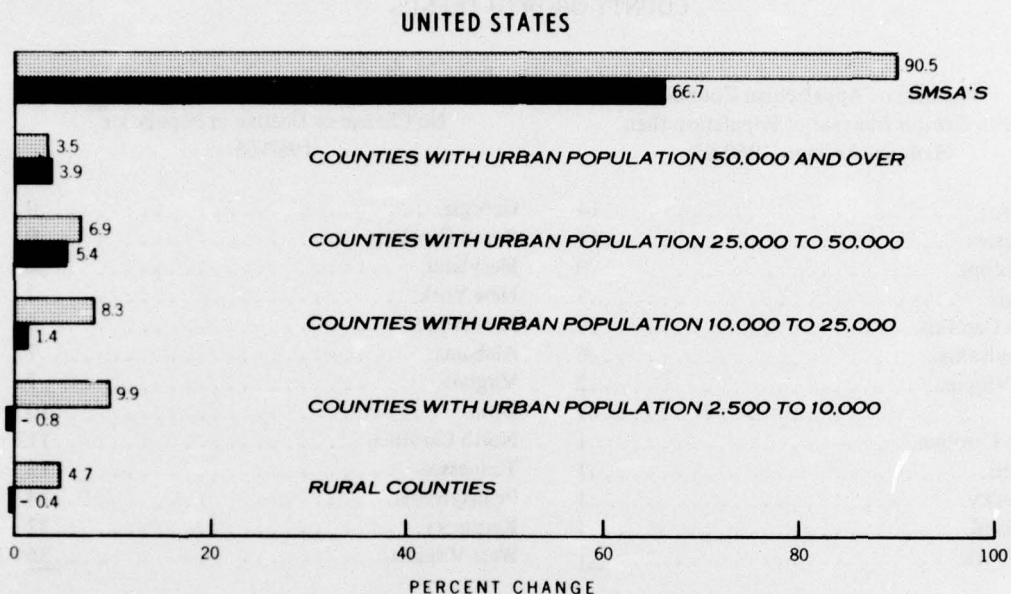
The level of urbanization is highly correlated with the predominance of high-growth manufacturing plants. Most Appalachian SMSA's have more than 25 percent of their

TABLE 2-1
COMPARATIVE POPULATION AND INCOME DATA
U.S., APPALACHIA, AND APPALACHIAN PORTION OF STATES

	Population Estimate 1966 (number)	Population Change 1960-1966 (percent)	Net Migration (number) 1960-1966	Per Capita Personal Income 1959 1966 (dollars)	Change In Per Cap. Income 1959-66 (percent)	Index of Per Capita Income 1959 1966 (U. S. = 100)
United States	196,920,000	9.8		2,161 2,963	37.1	100 100
Appalachia	18,246,400	3.0	624,700	1,661 2,297	38.3	77 78
Appalachian Portion of						
Alabama	2,160,000	9.0	15,100	1,573 2,169	37.9	73 73
Georgia	757,700	12.3	22,900	1,244 1,857	49.3	58 63
Kentucky	924,400	0.2	76,500	924 1,378	49.1	43 47
Maryland	209,700	7.1	2,500	2,115 3,136	48.3	98 106
Mississippi	432,700	6.5	8,300	1,025 1,590	55.1	47 54
New York	1,060,100	6.0	3,500	2,046 2,503	22.3	95 84
North Carolina	1,029,200	9.5	16,800	1,524 2,205	44.7	71 74
Ohio	1,152,600	2.9	30,500	1,501 2,054	36.8	69 69
Pennsylvania	5,880,800	0.8	330,900	1,985 2,683	35.2	92 91
South Carolina	626,900	6.9	11,800	1,575 2,487	57.9	73 84
Tennessee	1,716,400	6.8	12,000	1,485 2,188	47.3	69 74
Virginia	504,700	0.9	46,200	1,080 1,638	51.7	50 55
West Virginia	1,809,200	2.8	162,300	1,613 2,210	37.0	75 75

Sources: Population, U.S. Department of Commerce, Bureau of the Census
Income, U.S. Department of Commerce, Office of Business Economics
Data compiled by Appalachian Regional Commission

**DISTRIBUTION OF 1960 POPULATION AND SHARE OF POPULATION CHANGE,
1960-1966, BY URBAN SIZE GROUPS**



LEGEND



PERCENT DISTRIBUTION OF 1960 POPULATION



PERCENT SHARE OF POPULATION CHANGE 1960-66

SOURCE: Appalachian Regional Commission

TABLE 2-2
COUNTY GROWTH TRENDS

Numbers of Appalachian Counties with Greater Increase of Population than National Average, 1960-65	Numbers of Appalachian Counties with No Change or Decline in Population 1960-65
Alabama.14	Georgia.0
Tennessee.11	South Carolina.0
Mississippi.9	Maryland.0
Georgia.7	New York.3
North Carolina.7	Mississippi.5
Pennsylvania.6	Alabama.7
West Virginia.2	Virginia.7
Ohio.2	Ohio.10
South Carolina.1	North Carolina.11
Virginia.1	Tennessee.12
Kentucky.1	Pennsylvania.24
Maryland.1	Kentucky.32
New York.1	West Virginia.36
63	147

Source: Appalachian Regional Commission

manufacturing plants in the high-growth category, while counties with urban populations of 2,500 to 50,000 have 15 to 25 percent of their plants in this category. The level of urbanization is also highly correlated with the proportion of skilled workers. By 1975, Appalachian SMSA's are projected to have 15 to 25 percent of their workers in the high-skill category. The counties with urban populations of 10,000 to 50,000 will also have 15 to 25 percent (some with over 25 percent) of their labor force in this category. Eighty percent of the workers in this category will come (projected) from urban counties with urban populations of 2,500 to 50,000. Central Appalachia and the Highlands, by contrast, will probably supply less than 5 percent of this group.

From 1962 to 1965 the number of Appalachian counties with an unemployment rate of over 10 percent dropped from 146 to 57, almost two-thirds. In Central Appalachia and the Highlands, the drop was from 75 to 42, or less than half. Most of the counties that did not show employment improvement were in West Virginia and Kentucky.

Education

In 1960, Appalachia, with 10 percent of the nation's population, had more than 47 percent of the nation's functionally illiterate people. In Eastern Kentucky, where 80 percent of students' parents had left school before finishing the 12th grade, 55 percent of their children ended their education before completing the 9th grade. Further evidence of educational deficiency is the fact that of the youths tested for military service in 1966, 12.4 percent failed the general mental tests nationally, while in Appalachia the failure rate was 18.7 percent.

When the one student in ten completes college, and perhaps returns to Appalachia to teach, the region gains. However, nearly 70 percent of the young teachers returning to Appalachia leave after their first four years. This results in a steady aging of Appalachian teachers and a tremendous talent loss. Factors that account for some of these difficulties are:

1. In 1964, teacher salaries in Appalachia averaged \$4200,

compared to the national average of \$6200.

2. The 1962 Appalachian expenditure per pupil averaged \$337, compared to the national average expenditure of \$518.
3. In the mid-1960's more one room schools - 1046 of them - were found in Appalachia than in any comparable area of the U.S.
4. With preparation for work depending highly on proper

and early direction, guidance counselling is an important adjunct to education. In Appalachia in 1966 the student-guidance counselor ratio is one to 1300. Nationally, the recommended ratio is one to 300.

Appalachian development funds have enabled all states to improve their educational facilities to some extent. Facilities improvement, which includes the founding and support of numerous community colleges, is summarized in the following:

Public Facility Grants (to June 1969)

	<u>Number</u>	<u>Amount in Millions</u>
Higher Education Facilities	124	\$ 35.9
Vocational Education Facilities	235	71.6
Libraries	72	6.0
NDEA Grants to School Systems	30	<u>3.9</u>
Total		\$117.4

In addition, the Teacher Corps has been used on a limited scale in Appalachia. Teacher Corps activities (funded through June 1970) are underway at West Carolina State College, East Tennessee University, University of Kentucky (in cooperation with Morehead State University) and Marshall University. Also, graduate fellowship grants (\$435 million) for elementary and secondary school teachers and grants for colleges to improve graduate education facilities have been authorized for FY 1969-70.

Head-Start programs (in 1967) number 4,880 in Appalachia, primarily in Alabama (596), Kentucky (717), Pennsylvania (563), Tennessee (571) and West Virginia (797). This program reaches more than 80,000 children.

Educational TV has been growing in Appalachia. Each Appalachian state has an ETV

network either planned or in operation. Morehead State University, in Eastern Kentucky, has developed an adult education radio study program.

Vocational education programs are expanding rapidly. Appalachia has 13 percent of total national enrollment in secondary vocational education, and only 10 percent of national population. A 1968 report of the Appalachian Regional Commission's Education Advisory Committee indicated need for revamping the program. Revisions have been accomplished in some areas, to match training with job opportunities. Special programs will be undertaken with \$5 million authorized by the Amendments to the Vocational Education Act (PL 90-576). Advisory councils in each state will be created and planning initiated to meet long-term vocational education needs.

Many institutions are experimenting with new education facility concepts to meet the Region's needs. The School Planning Laboratory in the College of Education, University of Tennessee, is an outstanding example of this. Other institutional forms are being employed to raise the levels of education provided in Appalachia. Boards of Cooperative Educational Services (BOCES) in Appalachian New York exemplify this. Basically, the BOCES provide educational services for several school boards. They are, in effect, cooperatives made up of numerous local school districts, pooling resources to hire special services, such as science and language specialists.

Health

The general level of health in Appalachia is less than that of the nation at large. Infant mortality, deaths from infectious diseases and the incidence of tuberculosis greatly exceed national averages. The physician-population ratio is only two-thirds the national average, and a 1962 study showed that almost 2,500 physicians were needed to bring the ratio to that of the nation. In Central Appalachia, the average age of physicians is 55 years and replacements are not forthcoming.

Another aspect of health care is black lung disease (pneumoconiosis) found in the lungs of some coal miners. In 1963, the Department of Health, Education and Welfare found that one out of 10 active miners had x-ray evidence of the

disease as did one out of five of former miners in Appalachia. In Pennsylvania, at least 1,000 miners die each year from this disease, and that state appropriated \$57 million for disability claims in FY 1968-69 alone. New technology, with new research and safety policies, will help to reduce this social and economic problem.

Malnutrition, another aspect of health, is also prevalent in Appalachia. The Senate Select Committee Report on Nutrition and Related Human Needs indicates substantial existence of malnutrition among the poor. Estimates indicate that there are 900,000 children under the age of six in poor families in Appalachia, and approximately 1.6 million between the ages of six and sixteen. These children would be the ones most susceptible to problems of malnutrition.

The impact of malnutrition is most tragic upon children, for food deficiencies during infancy and childhood often interfere permanently with physical and mental growth. Evidence of this is found in the fact that by the age of three the child's brain achieves 80 percent of its adult weight, while the body achieves just 20 percent. Without adequate proteins the infant is left without the means to build an adequate mind, and later, an effective body.

Measures are being taken to improve health in Appalachia. The following indicates some of the projects undertaken.

Summary of Health Programs in Appalachia (June 1969)

	<u>Number</u>	<u>Amount</u> <u>(in Millions)</u>
Comprehensive Health Programs:		
Multi-county Demonstration Areas		
Designated	8	-
Planning-administrative Grants	14	\$ 1.8
Health Projects	143	29.2
Public Facilities Grants:		
Health Facilities	189	37.6
Water Pollution Control	156	<u>22.8</u>
Total		\$91.4



Examples of projects undertaken to improve health through the Comprehensive Demonstration Health Programs (in eight areas) include: training of personnel (auxiliary as well as established technicians), assisting in

development of new health and medical facilities, assisting development of water pollution and sewage treatment facilities, and planning new and advanced health programs (vaccination, ambulance service, rehabilitation services, care of aged, advancing tuberculosis eradication and treatment programs, and intensive care units for heart attack victims). As these facilities and programs bear on the problem, human resources will be released into employment opportunity.

Housing

More than one out of every four families in Appalachia lives in a house classified as sub-standard. Compared with the nation, twice as many Appalachians live in unsafe and unsanitary houses. Housing conditions in some parts of Appalachia are much below these regional statistics. For example, in several counties in Southern West Virginia and Eastern Kentucky, nine out of every ten homes are sub-standard. Table 2-3 presents a summary of the Appalachian housing condition.

TABLE 2-3
CONDITION OF HOUSING IN APPALACHIA
BY STATE AREA, 1960

State Area	Condition (Percent of Total)		
	Sound	Deteriorating	Dilapidated
Alabama	68.5	20.8	10.9
Georgia	70.9	19.8	9.3
Kentucky	57.5	30.1	12.4
Maryland	76.2	19.1	4.8
New York	79.8	16.0	4.2
North Carolina	71.0	20.0	9.0
Ohio	72.5	20.1	7.4
Pennsylvania	80.3	15.2	4.5
South Carolina	70.7	19.8	9.5
Tennessee	67.8	22.5	9.7
Virginia	63.0	25.3	11.6
West Virginia	68.5	22.1	9.4
Appalachia Total */	73.2	19.2	7.6

*/ Rounding in unit figures may distort % totals

Source: Appalachian Regional Commission compilation from U.S. Census of Housing.



In the fall of 1967, Congress amended the Appalachian Regional Development Act to include Section 207, authorizing the Appalachian Housing Fund. Under this section planning loans and grants may be made to sponsors of low and moderate income housing projects, authorized under Section 221 of the National Housing Act. Several 221 programs are designed to encourage the construction of rental housing and housing for low income families, insure mortgages to non-profit corporations for the rehabilitation of low income housing, and increase the purchase of sub-standard housing by corporations for rehabilitation and sale to needy families. The 221 programs were not being utilized in Appalachia because the housing sponsors did not have the financial means to develop plans and mortgage applications, pay for land options, and, in general, perfect their applications. Through Section 207 grants or loans (the "seed money"), housing sponsors can receive up to 80 percent of the cost of planning and obtaining the financing for projects.

The Appalachian Housing Fund assistance may cover organizational expenses (overhead costs), fees for attorneys, housing consultants, architects and engineers, plus funds necessary to cover land options and FHA application charges. Local sponsor's 20% cost may be recovered upon approval of the project.

Until the program began, the Region found it extremely difficult to participate in the Federal housing programs. In the six years prior

to Section 207, only 602 low and middle income Federal housing units were built in Appalachia.

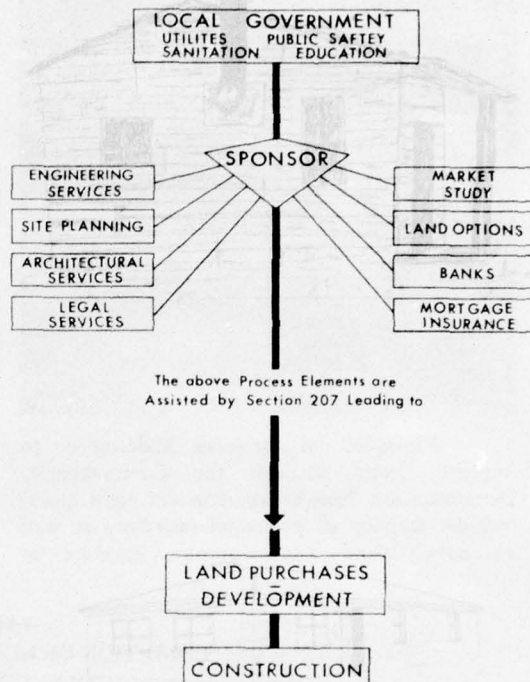


FIG. 2-5. HOME BUILDING PROCESS UNDER SECTION 207 OF THE APPALACHIAN REGIONAL DEVELOPMENT ACT.

Since the Appalachian housing program got underway in the spring of 1968, the Appalachian Regional Commission has approved over \$800,000 in no-interest loans to non-profit sponsoring groups. These loans generated (to June 1969) 24 housing projects valued at more than \$31.0 million and will provide 2400 new dwelling units for Appalachian families in Georgia, Kentucky, Pennsylvania, New York, Ohio and West Virginia.

Rapid redevelopment of the housing industry and rehabilitation of housing in Appalachia will enhance the region's general economic development. Figure 2-5 indicates the home building process and assistance provided under Section 207 of PL 89-4.

4. THE ECONOMY AND ITS DEVELOPMENT

The development pattern of Appalachia reflects the topographic characteristics of the area. The ranges of the Appalachian Mountains have a northeast-southwest orientation, the side slopes are steep, and the valleys are narrow. Much of the early movement of settlers and their supplies were along the streams located in these valleys, or in the gaps and passes between them, and it was there that their first communities developed. Since the only lands suitable for settlement were in the flood plains along these streams, communities grew thereon.

At first, much of the goods imported were moved by boat along these rivers. Because of the topography, the railroads and highways later

stayed in the valleys and generally paralleled the streams. There was little communication across the mountains since few passes were available. The Erie Canal created a trade route to the New York-New England area, and the Susquehanna Valley provided access to the Chesapeake Bay, as did the Potomac and James River Valleys. The Ohio River system provided access to the Mississippi River and, in turn, to the Gulf of Mexico. The southern part of Appalachia had access to the eastern seaboard through the valleys of the Yadkin-Pee Dee, Santee, and Savannah Rivers; and to the Gulf of Mexico through the Chattahoochee, Alabama-Coosa, and the Warrior-Tombigbee.

Development of an efficient transportation system is essential to economic growth in Appalachia. Expansion of existing industry and



The Start of an Appalachian Corridor

development of new are vitally linked to a fast, efficient, closely integrated transportation network. Movement of raw materials to manufacturing centers and distribution of finished products to markets in and out of Appalachia must occur over a smooth-running, diversified transportation system if industry is to flourish.

All of the major transportation media - highway, rail, air, pipeline and waterway - serve the Appalachian Region.

Highways

For many years, highways in Appalachia were inadequate, often narrow and tortuous, acting as an impediment to efficient travel and economic growth. Except for that provided by a limited number of Federal highways, and the Pennsylvania Turnpike, access to much of the region was difficult. Paved roads in much of Central Appalachia were unknown until just before World War II. The Appalachian Mountains formed major physical barriers to development of an adequate system, not only to internal traffic but also to traffic through and to the region. However, with completion of the Appalachian Development Highway System and the Interstates, some of the major deficiencies will be alleviated, surmounting physical barriers and providing relatively easy, rapid travel to and through Appalachia, along both traditional and on new routes. Figure 2-6 shows the Appalachian Development Highway System.

Waterways

Much of the urban-industrial development in America has occurred along the waterways, inland lakes, and coastal areas. Inland waterways play an increasingly important part in urban-industrial expansion. River navigation in Appalachia has provided low-cost movement of bulk commodities to, within and from the region. Portions of two of the major river navigation systems in the United States are located in Appalachia - the Mississippi River Inland Waterways System and the Black Warrior River System which ties to the Gulf Inter-coastal Waterway. Parts of the Ohio River Basin comprise that portion of the Mississippi River Inland Waterways System in Appalachia including

the Ohio River itself and the Allegheny, Monongahela, Kanawha, Kentucky, Cumberland and Tennessee Rivers. The Great Lakes navigation system touches Appalachia at the northwestern corner, providing 28 foot draft traffic to Chicago and the Atlantic Ocean.



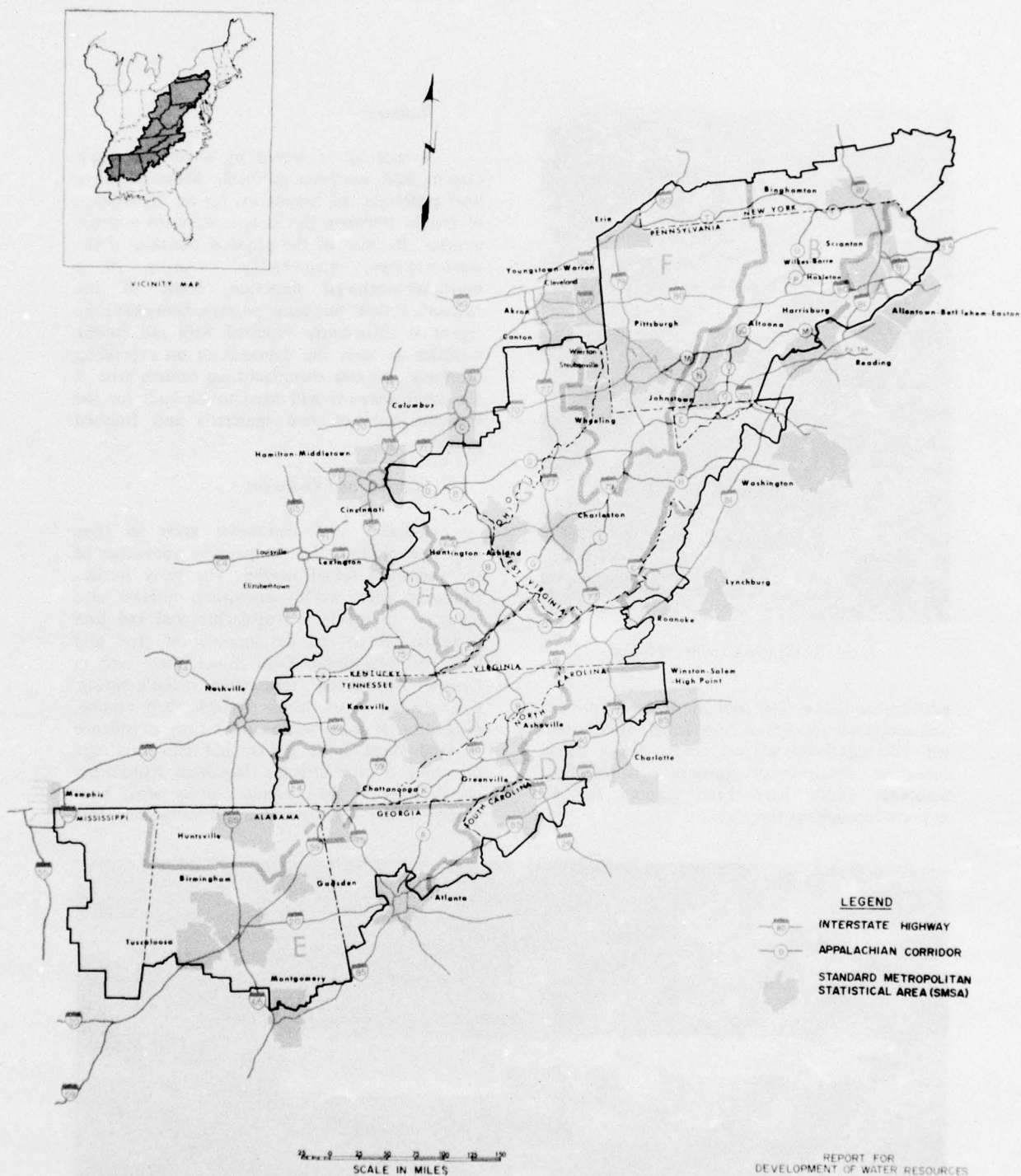
Navigation on the Tennessee

Commerce on the Ohio River System has continued to increase. To meet the demands of increased traffic and new equipment and operational methods, modernization of the existing systems on the Ohio, Monongahela, and Cumberland Rivers is well underway. Additions to and improvement of the entire system will continue in the future. Traffic on the Black Warrior is also steadily increasing, averaging 8 million tons annually.

Because of the increasing need for additional waterways, several projects have been authorized. These include the Coosa River project which would extend navigation from the head of the Alabama River Waterway (now under construction) at Montgomery northeastward to Rome, Georgia. The authorized Tennessee-Tombigbee Waterway (in the advanced planning stage) will extend northward from the Black Warrior River above Demopolis, Alabama, to the Tennessee River in the pool created by Pickwick Dam.

Airways

A study of the air transportation system in Appalachia (less Mississippi) was completed in 1967 by Management and Economics Research, Incorporated, for the Appalachian Regional Commission (*Guidelines for an Appalachian Airport System*). Figures 2-7 and 2-8 display the airway system in the region, indicating projected



APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM

OFFICE OF APPALACHIAN STUDIES

AUG. 1969



Asheville-Hendersonville, N. Car.

patterns of traffic flow and the status of present and projected airports in Appalachia. This system will add significant market access, and enhance economic development prospects. Appalachian assistance funds have been granted for 43 airports throughout the region.

Railways

Appalachia is served by all of the major eastern and southern railroads. Many of these lines penetrate the mountains for an interchange of freight between the eastern seaboard and the interior. Because of the physical position of the mountains, generally running in a northeast-southwest direction, many of the railroads follow this same pattern. Generally, the region is sufficiently supplied with rail freight facilities to meet the demands of an expanding economy. As new manufacturing centers arise, a few improvements will have to be built for the transportation of raw materials and finished products.

Industry and Commerce

Industry and commerce grew in river towns, exploiting the comparative advantage of the resources found nearby. The early settlers expanded their initial agricultural interest into industry. In northern Appalachia coal and iron deposits led to the development of steel and basic manufacturing. Coal mines there and in Central Appalachia, supporting manufacturing, have caused waste lands through strip mining, deposition of mine wastes, mine fires, subsidence of land above mine shafts, and mine drainage pollution of the streams. Southern Appalachia has become a light manufacturing area, with some heavy industry at Birmingham and



Revere Brass and Copper's New Aluminum Plant at Scottsboro, Alabama. The Tennessee is in the Background.

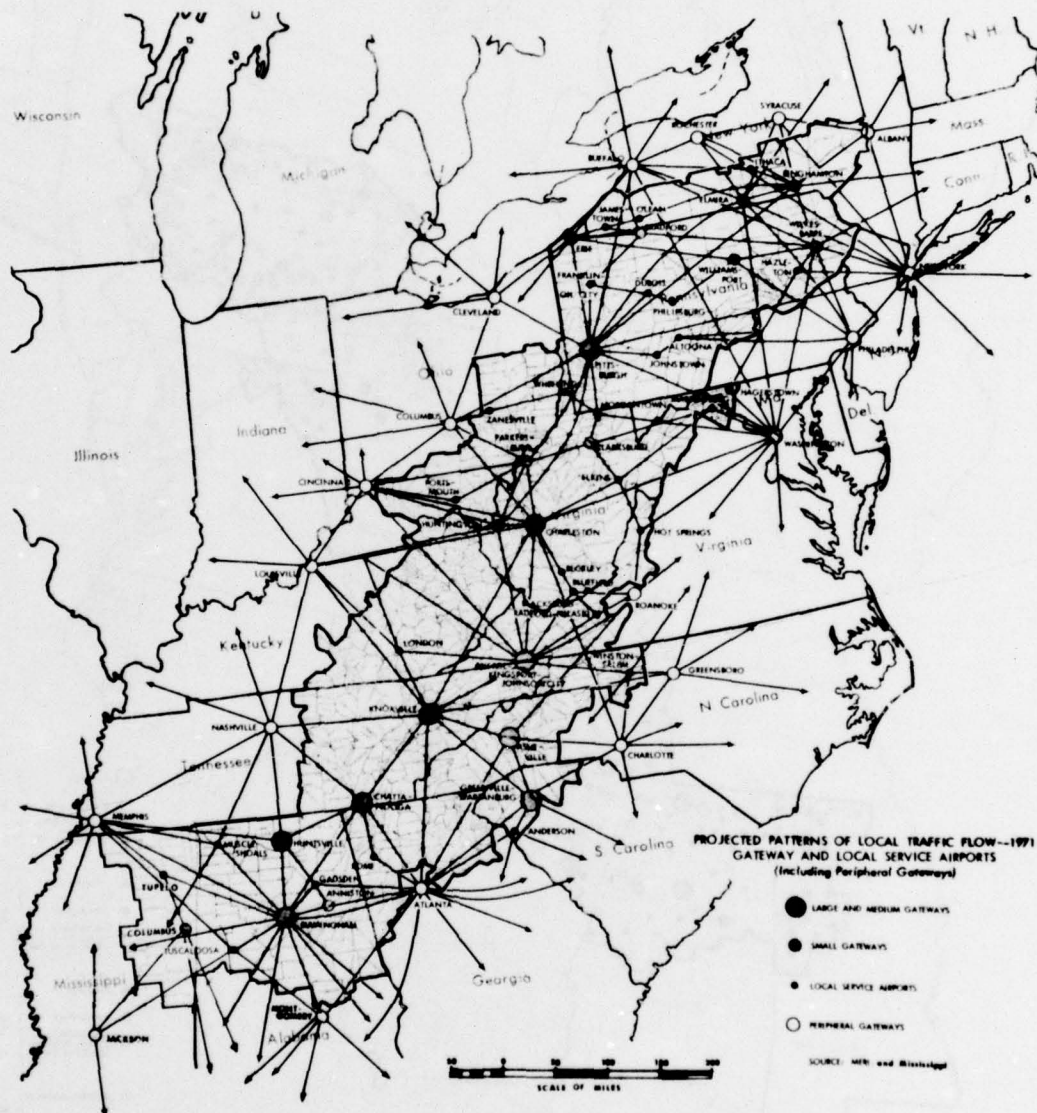


FIGURE 2-7. PROJECTED AIR TRAFFIC FLOW IN APPALACHIA

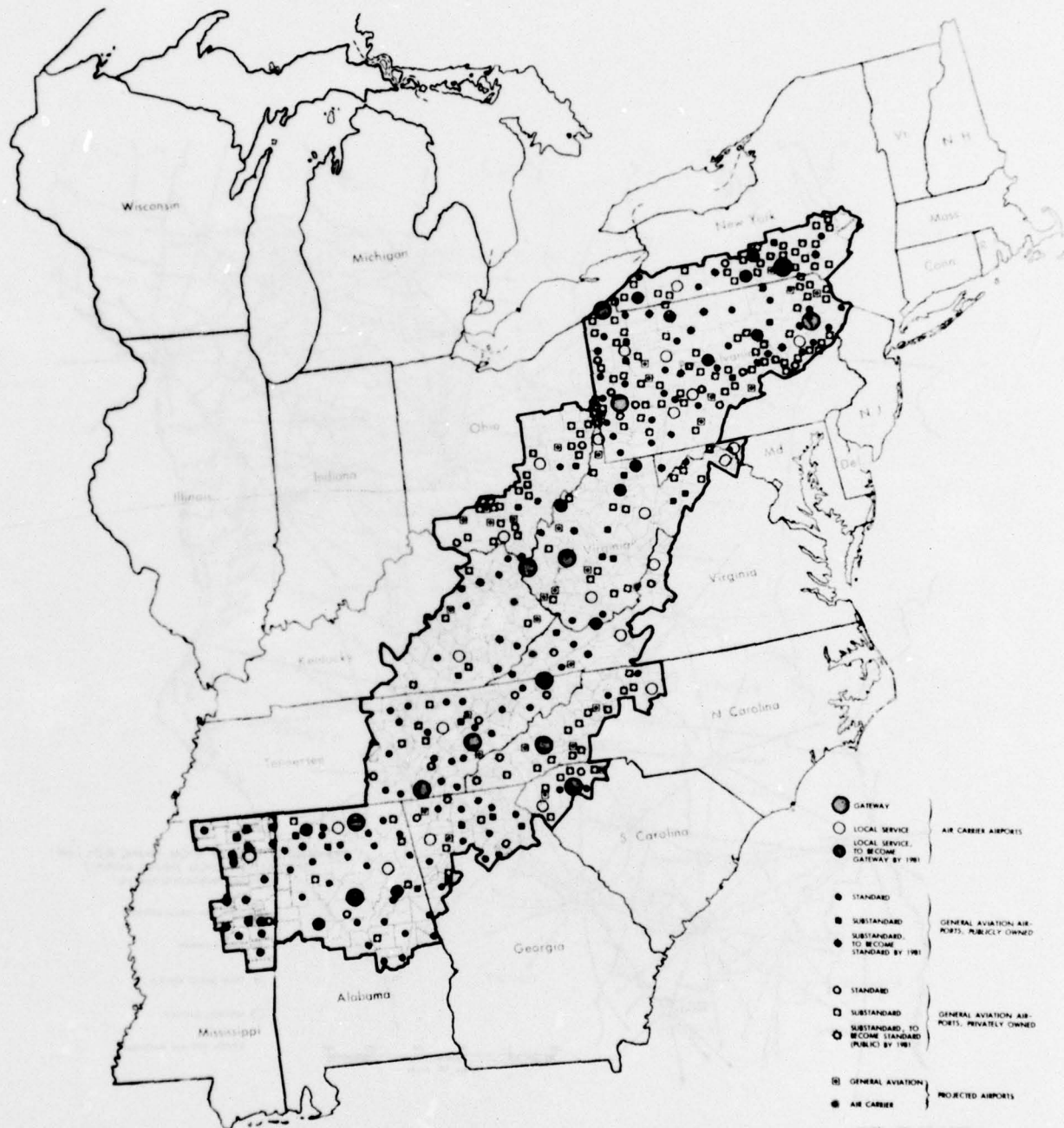


FIGURE 2-8. PRESENT AND PROJECTED AIRPORTS IN APPALACHIA

SOURCE: BUREAU OF TRANSPORTATION

Gadsden, Alabama. The Highlands have supported a timber industry, but the natural beauty of the area has attracted a large and growing recreation industry.

In 1960, the major manufacturing sectors in Appalachia were primary metals, food processing, petroleum, textiles, chemicals and paper, accounting for about 39 percent of total employment; agriculture, mining and construction accounted for 17 percent, and transportation, trade and services accounted for 43 percent of the total.

The sub-regional reports in Part II describe the nature of industry and commerce in each of the 10 water sub-regions.

The Growth Centers

Recognizing the nature of the region's economy, with different heritage and problems in each sub-area, the Appalachian States have designated growth centers to foster the development strategy of placing developmental investments at locations where future growth is most likely to occur. Figure 2-9 shows the growth centers.

These centers cover approximately 12 percent of Appalachia's geographical area. Within these centers or growth nodes lie 80 percent of the people, 88 percent of the bank deposits, 88 percent of the retail trade, 92 percent of the wholesale trade, and 92 percent of the major services. These growth areas obtained 86 percent of all increases in regional personal income between 1959 and 1965.

Regional centers [2] are important metropolitan areas, such as Pittsburgh, providing specialized services and employment opportunities that extend well beyond the boundaries of the planning and development district in which they are located. Investments made in these centers are "region-serving"; that is, they are designed to improve services and employment for a large area of the Appalachian Region, embracing several planning and development districts.

Primary centers are communities, or a complex of communities, such as the Tri-Cities

area of Eastern Tennessee, where state analyses indicate a major portion of the future employment base of the district is likely to be located. Investments in these centers are designed to enhance their competitive advantages for economic growth by providing the public facilities needed to attract new enterprise and support the expansion of existing enterprise.

Secondary centers are communities where a significant employment base may not develop, but from which it is necessary to provide services to a large surrounding rural hinterland if significant isolated populations are to be given the aid, skills and training they need to compete for opportunities.

5. THE REGION'S POTENTIAL

In order to estimate what the Appalachian economy would look like in the future, Appalachia was divided into 27 economic sub-regions (See Figure 2-10). The 27 economic sub-regions, 10 water sub-regions, and 60-odd state planning sub-regions of Appalachia were used in developing projections and benchmarks of population, employment by industry group, per capita income, and gross output per employee.

The Region had 12.6 percent of the nation's population in 1940 and 10.6 percent of the total employment. By year 1960, population had decreased to 9.8 percent, and employment to 8.8 percent. These relationships to the nation point out very dramatically the Region's decline. Projections based on these trends for year 2020 show 7.8 percent for population and 7.3 percent for employment.

The historic projections indicate an Appalachia continuing in the economic doldrums. The benchmarks (see p. I-1-4) provide targets for Appalachian economic growth, utilizing regional potential. Achievement of the benchmarks, the goal of public and private planning, will release this potential to enhance a healthy national economy. Figures 2-11, 2-12 and 2-13 provide graphic display of the relationships between projections and benchmarks.

As an indication that the benchmarks are attainable, a short range projection based on

APPALACHIAN REGION

DISTRICT CENTERS

as Delineated by the States

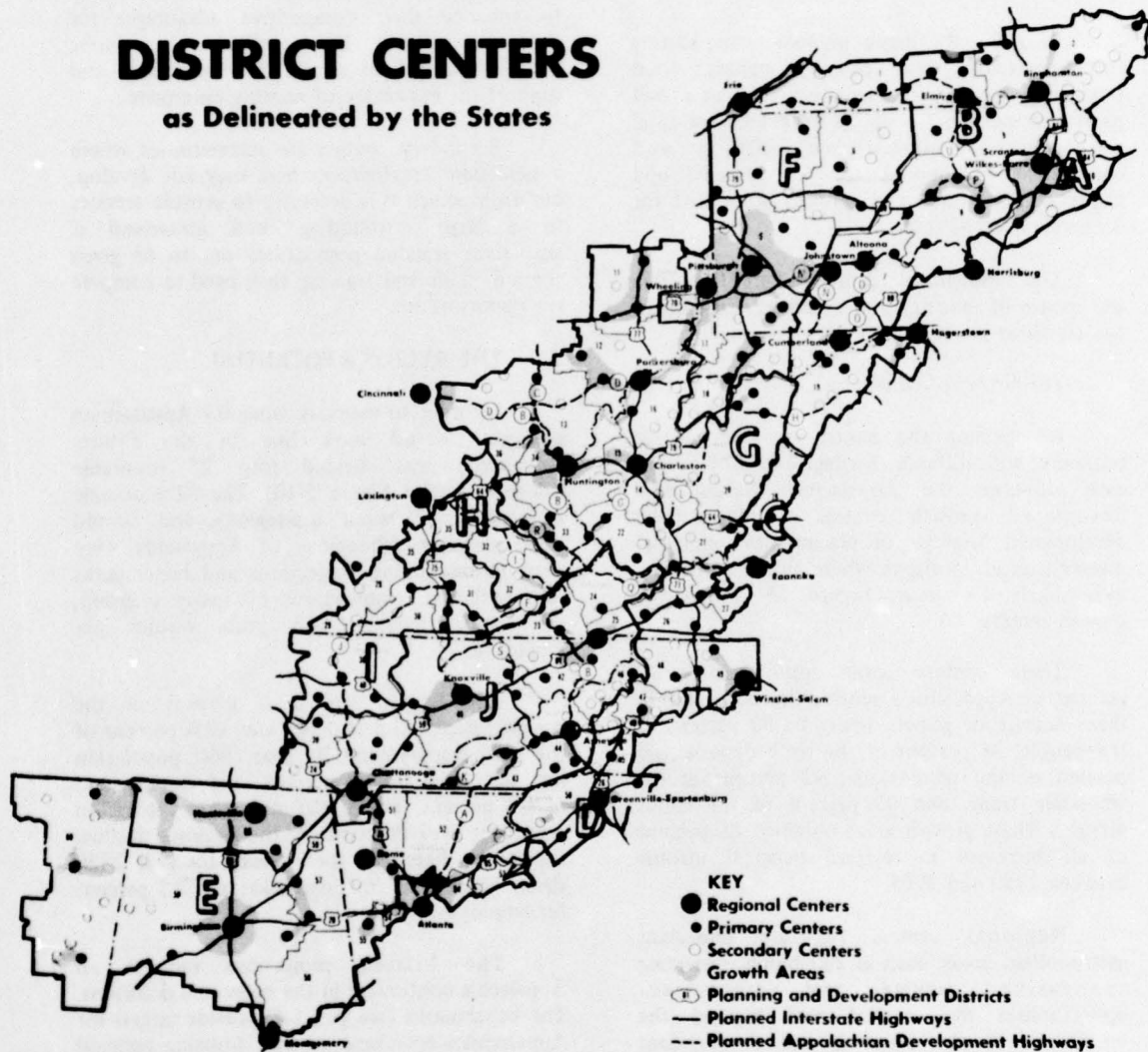
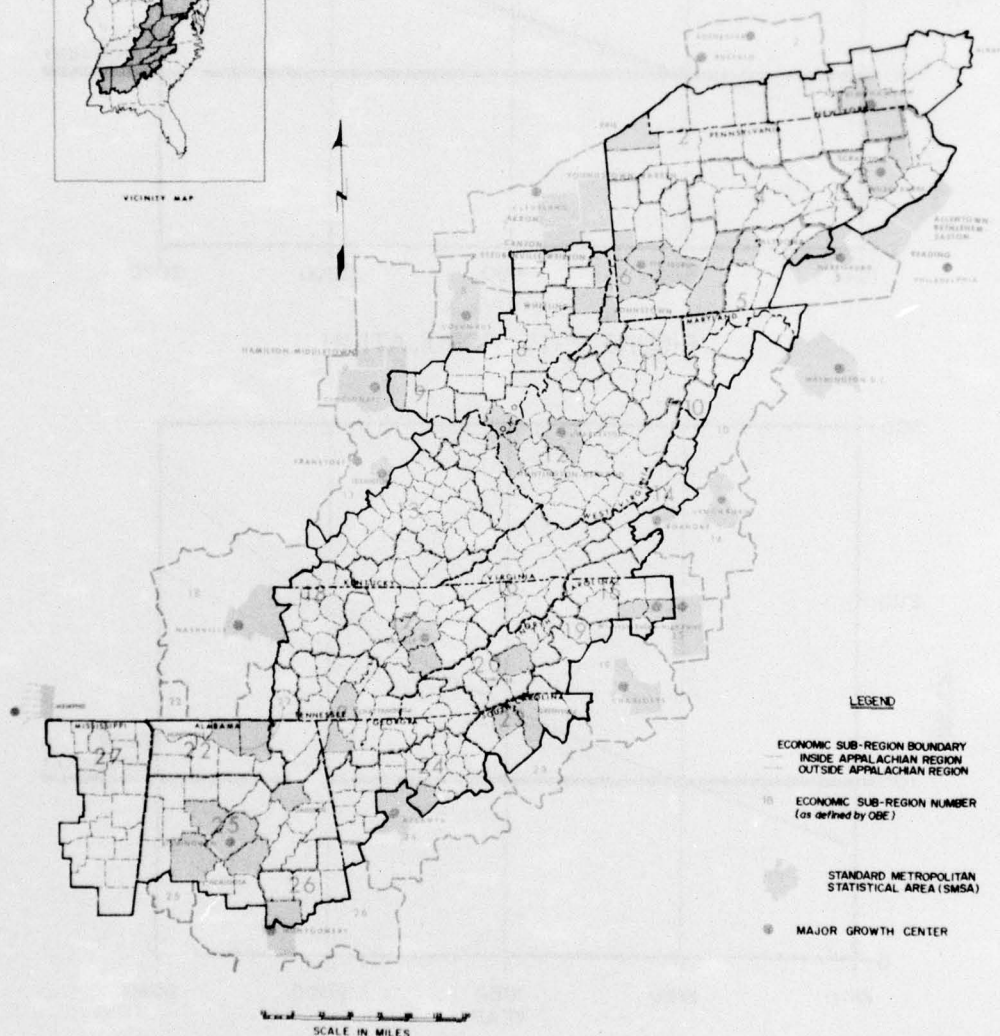


FIGURE 2-9

State-Delineated District Centers in Appalachia



VICINITY MAP



REPORT FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA

ECONOMIC SUB-REGIONS OF APPALACHIA

OFFICE OF APPALACHIAN STUDIES

AUG. 1968

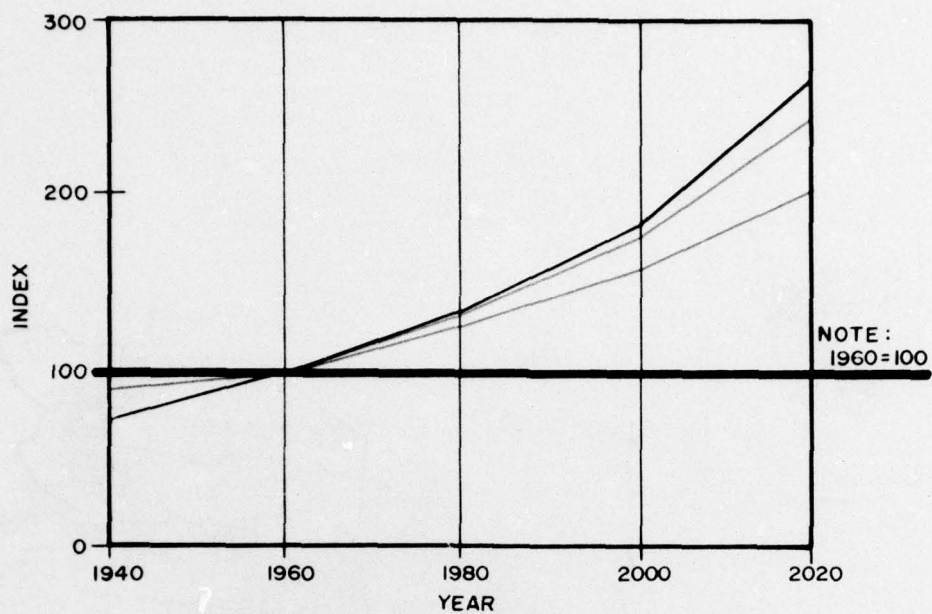


FIGURE 2-11 POPULATION

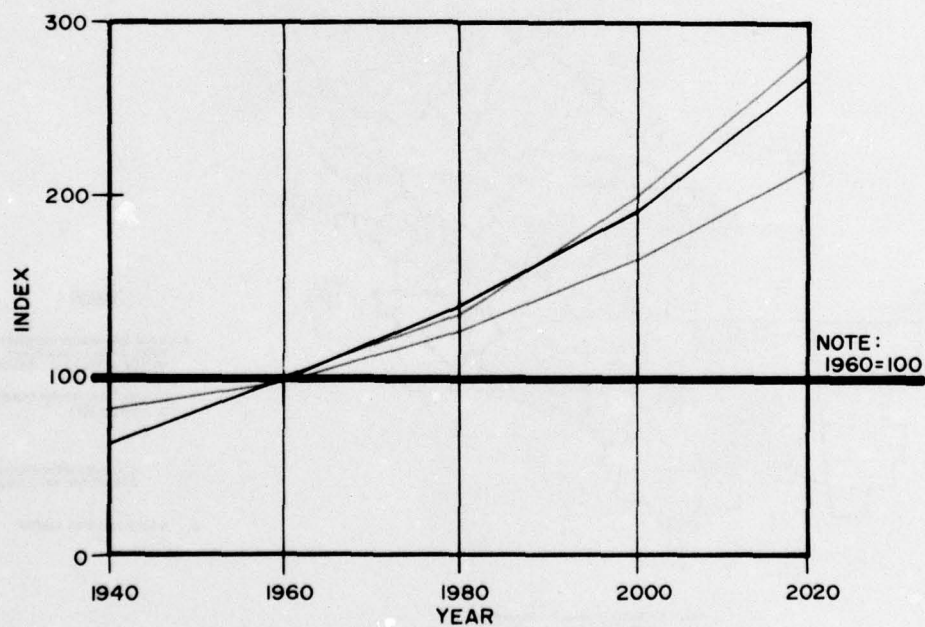



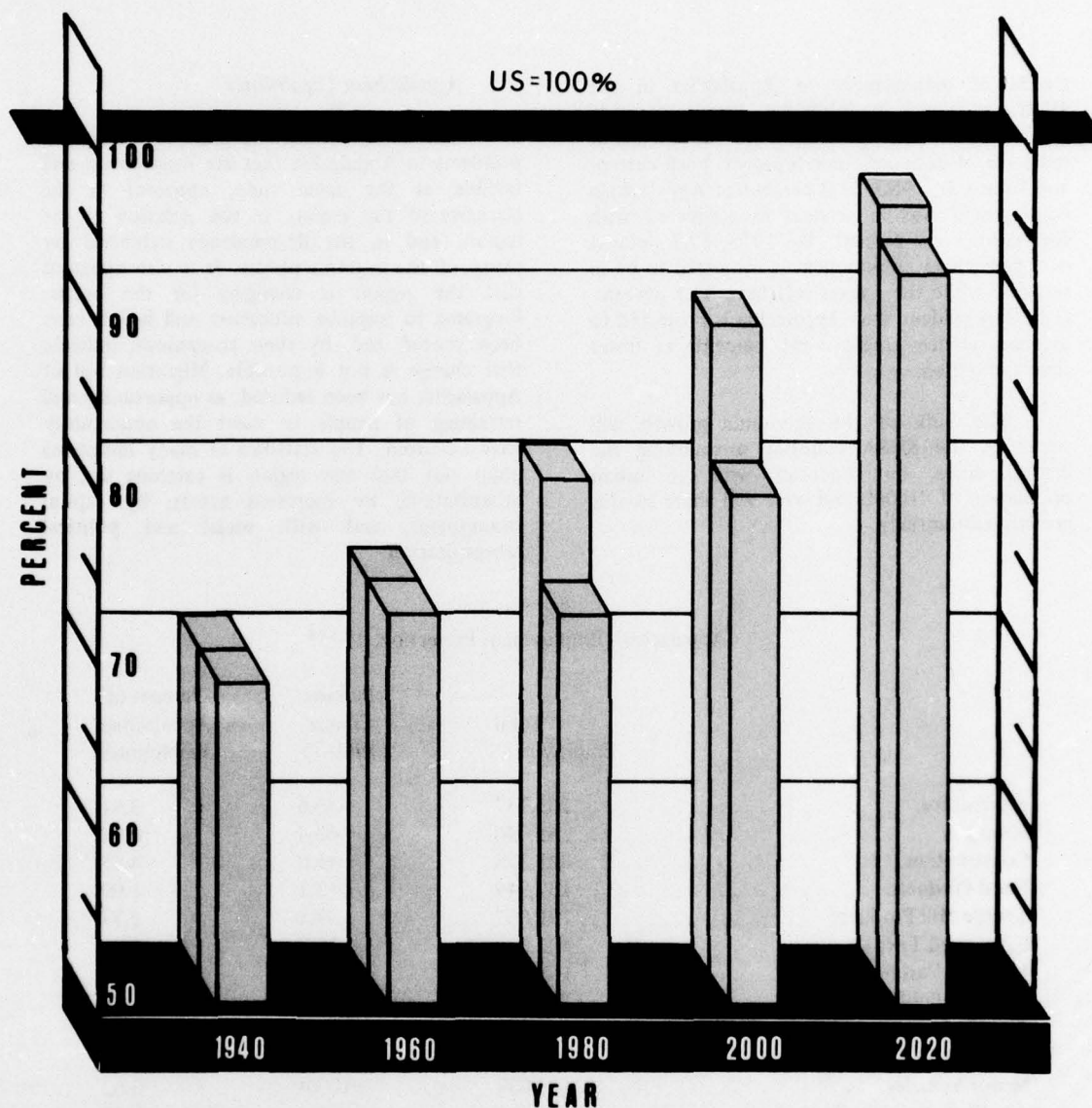


FIGURE 2-12 EMPLOYMENT

-  UNITED STATES
-  HISTORICAL AND PROJECTED
-  DEVELOPMENTAL BENCHMARKS

INDICES OF CHANGE U.S. & APPALACHIAN REGION






-  **UNITED STATES**
-  **HISTORICAL AND PROJECTED**
-  **DEVELOPMENTAL BENCHMARKS**

FIGURE 2-13
PER CAPITA INCOME
APPALACHIAN REGION,
PERCENT OF U.S.

trends of employment in Appalachia in the 1960's is shown in Table 2-4. Improvement in the non-commodity producing sectors is a major indicator of economic development, both current and future. In 1960, 51.2 percent of Appalachian employment was in services as compared with the nation's 60 percent. By 1975, 57.7 percent of Appalachian employment is projected to be in services, while the nation will have 64.1 percent. It is thus evident that Appalachia is projected to increase service employment percentages faster than the nation.

The bulk of the economic growth will occur in the SMSA counties surrounding the central cities, but counties with an urban population of 10,000 and over will share in this growth substantially.

Appalachian Capabilities

The above discussions indicate a range of problems in Appalachia that are magnificent and terrible at the same time, apparent in the statistics of the region, in the isolation of the region, and in the despondence exhibited by many of the region's people. It is also apparent that the region is changing for the better. Programs to improve education and health have been started and, by their acceptance, indicate that change is not impossible. Migration out of Appalachia has been reduced, as opportunity and retraining of people to meet the opportunity have occurred. The statistics of many indicators point out that the region is catching up, by urbanization, by increased access, by capital investment, and with social and political reorganization.

TABLE 2-4
Appalachian Employment Projection, 1975*

	Total Employment	Percent Change 1960-75	Percent of Appalachian Employment
Agriculture.	263,737	-36.6	3.81
Mining.	65,046	-68.4	0.94
Construction.	321,378	+5.0	4.65
Food Products.	137,949	+3.1	1.99
Textile Mill Products.	191,832	-7.1	2.77
Fabricated Textiles.	402,898	+85.7	5.83
Lumber, Furniture.	161,046	+7.1	2.34
Printing, Publishing.	100,512	+44.6	1.45
Chemicals.	123,529	+7.5	1.78
Machinery.	255,970	+6.2	3.70
Motor Vehicles.	43,039	+100.4	0.62
Air, Ship, Railroad Equipment.	44,905	+4.4	0.65
Misc. Manufacturing.	808,517	+6.8	11.70
Services:			
Transportation, Warehouses.	178,188	-26.8	2.57
Communications.	45,089	-20.4	0.65
Utilities.	59,242	-9.0	0.85
Trade.	1,347,346	+35.9	19.50
Finance, Insurance, Real Estate.	282,191	+75.0	4.12
Other Services.	1,258,894	+43.2	18.22
Civilian Government.	815,559	+60.3	11.80
TOTAL Appalachian Employment.	6,907,867	+19.3	100.00

*Source: Dr. Robert Rayford, Office of Program Analysis and Economic Research, Economic Development Administration

References:

- [1] This summary was prepared from two articles: Kublawi, Salim, "Urbanization and Regional Growth", *Appalachia*, April, 1969, and March, Eli, "Indicators of Appalachian Progress: Population and Income", *Appalachia*, March, 1969.
- [2] The classification of three types of growth centers by ARC was published after much of the AWRS was completed, using an earlier classification of only primary and secondary. In this report, therefore, references to primary growth centers include the current classifications of both regional and primary, while the reference to secondary growth centers remains the same.

CHAPTER 3 - APPALACHIA'S OVERALL NEEDS, AND THE RELEVANCE OF WATER RESOURCES DEVELOPMENT

1. GENERAL NEEDS

The problems of Appalachia -- stemming as they do from economic underdevelopment, social deterioration, and general inability of private and public efforts to draw the region into the mainstream of American urbanization and economic prosperity -- are similar to those of many underdeveloped regions, here and abroad. Economic development is a complex process which starts with *creating a favorable economic environment*. Such an environment is made up of many elements: (1) a healthy and trained labor force; (2) adequate capital and infrastructure; (3) viable communities with adequate facilities for health, housing, recreation, and advanced education; and (4) an ownership (and legal) structure which makes possible effective utilization of natural and capital resources of the region in private and public ventures. These needed conditions, if not present, can probably only be developed where state and local governments are capable of ordering social and economic events.

In Appalachia, as in other underdeveloped areas, it has usually proved possible to provide the technological knowledge essential to development, but it has proven much more difficult to generate the local entrepreneurial and managerial skills needed to carry the region into the self-sustained phase of economic development. Development of managerial know-how in underdeveloped regions is difficult, since it requires changes in traditional value systems. In the lagging parts of Appalachia, the conservative and prevailing value systems do not encourage the interdependent and cooperative action required for successful community development, and for effective industrial organization, or even service oriented employment.

The conditions for development are emphasized to indicate that economic and social development in Appalachia will be a long and complex task. Development will come about best in response to a well designed "package" of development efforts and not to a single program,

however "needed" or well directed. Water development, for example, is clearly needed in many parts of Appalachia, but only rarely can it be considered the cornerstone of economic development. Usually communities needing water resource management also need a number of other elements essential to the development process. The challenge to the water resource planners is fitting the water program skillfully into the package of developments necessary to bring about a "favorable economic environment." Naturally, the package will vary from place to place and from time to time. The success of any package depends, in the last analysis, on whether the local community can take cooperative action.

2. SOCIAL DEVELOPMENT

Appalachia is a diverse land in terms of its physiography, its history, and its level of social development. There are some general observations which facilitate understanding of the character and magnitude of the "Appalachian Problem." Manufacturing has long been the most important source of employment in Appalachia, but the degree and pattern of urbanization in Appalachia lags far behind the needs of a modern manufacturing-industrial society. Appalachia, in 1964, contained about six percent of the nation's land area and nine percent of its population, but accounted for 10 percent of U.S. manufacturing production and 12.4 percent of the U.S. employment in manufacturing.

These figures suggest the existence of many well developed urban centers. But even many of these have few aspects of the true urban community and many qualities of country life--a country life with little economic tie to the land. Even in Central Appalachia, with one of the most dense and poverty stricken rural populations of the U.S., most families that work, work in mining and manufacturing. The failure in Appalachia to develop adequate urban centers and facilities, and to move toward an integration of the rural non-farm and urban population is at the heart of many of the problems and needs of this region.

Yet, Appalachian political and social organization is characterized by interdependent urban and rural economies. The Appalachian Program has incorporated recognition of this fact and does not carve out the urban areas from the rest of Appalachia and exclude either from regional development. However, the isolation sought by initial settlers of Appalachia has created the setting for many diverse and provincial political organizations whose myopic view of the world has further inhibited growth.

All too often small populations, combined with an underdeveloped economy, provide an inadequate tax base for rural governments to offer competitive educational, health, and employment opportunities to their citizens. Talented local leadership needed to cope with the multitude of fiscal and administrative problems in the multiplicity of jurisdictions is also lacking.

The lack of adequate urban development has had many adverse, long run, and complex consequences for Appalachia. It has encouraged industries exploiting natural resources and discouraged industrial diversification. In the one commodity, one company or one industry community, there has often been little experience in cooperative action and planning, as a normal community effort. Also the resources-based economy in most of Appalachia has generated payrolls that have been spent elsewhere because the region lacks urban centers and the essential services they provide. Thus, industrial, agricultural and mining payrolls have not generated the regional growth that is needed or attainable.

Opening the region, through the Appalachian Developmental Corridor System, to the flow of national commerce and promoting jobs and services are necessary steps to development, along with improvements in education, health, and other public services. The acute shortage of true urban centers in Appalachia, however, along with understaffed and underfinanced local governments, inhibit achievement of the potential inherent in physical facility programs.

The Appalachian Program takes cognizance of this in supporting multi-county Local

Development Districts. These districts surround a growth center, serving the total district with skills no one unit of government could afford. Such district organization becomes the focus for planning beyond current county-city boundaries, attacking common problems and constraints to economic development. State and Federal government participation, by supplying minds and money, further enhances the effort. See Figure 3-1 for a conceptualization of the Local Development Districts.

Effective planning of transportation, education and community health, as well as of water resources can now be foreseen. The Appalachian Regional Commission has developed strategies which will assist Appalachian districts to organize for effective economic and social development. These involve improving existing urban service centers, extending the boundaries of some existing service centers, creating new towns at strategic points, and a number of innovative plans for taking jobs and services to workers in isolated communities. The problems and needs of Appalachia must be appraised in terms of the necessity for strengthening the more viable communities. It is for this reason that the water resources survey has emphasized the needs of the present and emerging growth centers.

3. TRANSPORTATION

Highways

Isolation is one of the most frequently mentioned characteristics of Appalachia one of the principal reasons for the slow economic development of the region. It is only recently, with the development of heavy road equipment, that it has been feasible to build highways with available funds through the mountains along direct routes. Construction of an adequate arterial road system has been given a high priority by the Appalachian Regional Commission and the Appalachian States, reflecting their assessment that road development is essential to the successful development of other resources.

Railroads

The railroad network of Appalachia is comprehensive, though specialized. It was

1 U.S. CONGRESS

Establishes broad guidelines and planning principles, outlines programs and defines responsibilities of Appalachian Regional Commission.

2 APPALACHIAN REGIONAL COMMISSION

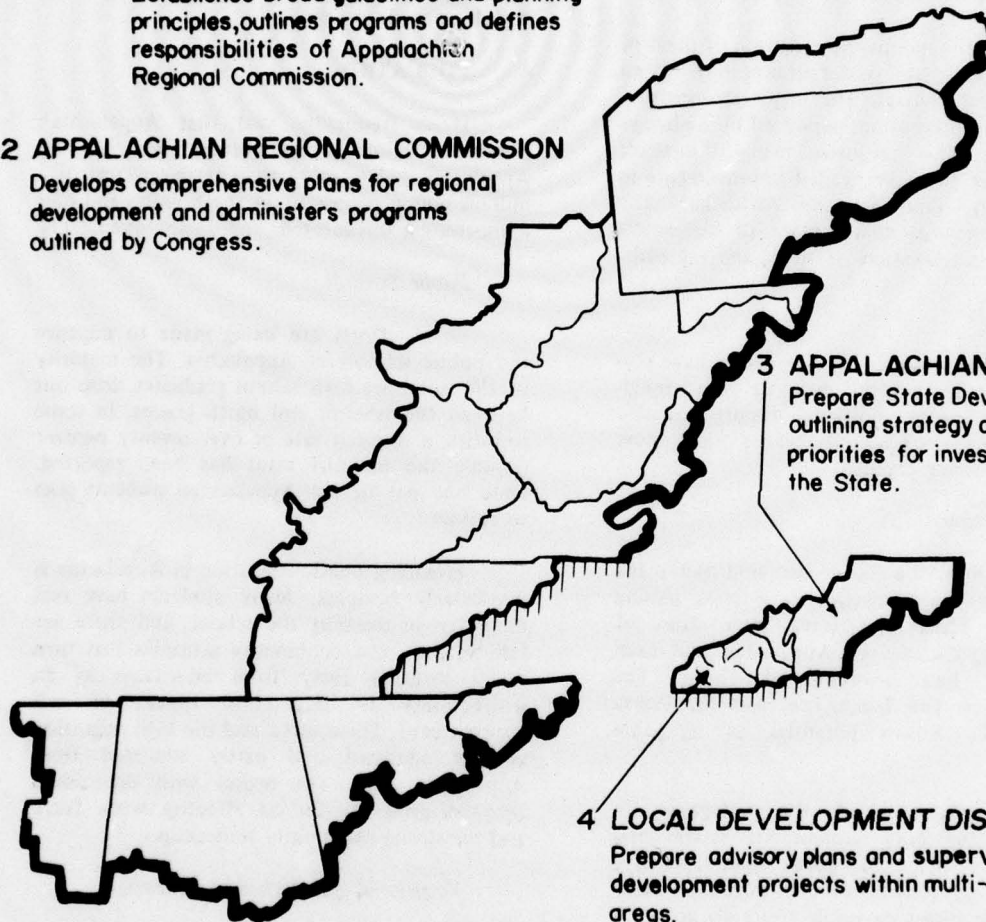
Develops comprehensive plans for regional development and administers programs outlined by Congress.

3 APPALACHIAN STATES

Prepare State Development Plans, outlining strategy and setting priorities for investment within the State.

4 LOCAL DEVELOPMENT DISTRICTS

Prepare advisory plans and supervise development projects within multi-county areas.



PLANNING : THE APPALACHIAN APPROACH

FIGURE 3-1

developed in the 19th Century, largely to service the logging, mining and steel-making industries. New or small industries have found it difficult to obtain the type of rail service they need.

Due to the mountainous terrain of most of Appalachia, highways and railroads have often followed water courses. The major streams are, almost without exception, paralleled by highways and railroads. This has often made it difficult and expensive to make needed improvements in the highways, railroads, and particularly the waterways, because improvement of waterways often requires relocation of roads and railroads.

Airports

Adequate airports for Appalachia have also been limited, largely due to the rough topography. Several additional airports, capable of handling jet-powered planes, are now underway or being planned.

Navigation

The Ohio, the Tennessee, and the Black Warrior Rivers have navigation systems serving Appalachia. These waterways have been of economic significance to Appalachia and each generation has modernized them. The Chattahoochee, the Tombigbee, and the Coosa Rivers offer future potential as navigable waterways.

Full utilization of the waterways in Appalachia for both commercial traffic and recreation will not come about until there is a region-wide appreciation of their potential. Many cities on the major navigable rivers do not have port facilities essential to effective river use. There is need for a regional transportation plan which would include effective integration of barge, rail, trucking, and air services.

Impacts of Transportation Development

The development of new highways and new airports opens the possibility of new markets within Appalachia and more contact with outside economies. It may also make possible new town sites. The tourist and recreation industry will be influenced as tourist traffic patterns, from the northern cities to the

southland, may be substantially altered and many new scenic areas for year-round recreational use will become accessible. As these developments materialize, the water resource needs of Appalachia will change.

4. EDUCATION

It is frequently said that Appalachia's greatest resource is its youth. Even so, "In Appalachia today, more than three-quarters of a million young people sit in the hollows and hills unmotivated, uneducated, and unemployed." [1]

Public Schools

Great efforts are being made to improve the public schools of Appalachia. The majority of the potential high school graduates drop out between the seventh and ninth grades. In some counties, a dropout rate of over seventy percent (double the national rate) has been reported. Only one out of ten Appalachian students goes to college.

Providing public education in Appalachia is particularly complex. Many students have real difficulty in reaching the school, and there are family, class, and community attitudes that turn many students away from education as an unnecessary or impractical means of self improvement. These facts, and the high migration of the educated and partly educated from Appalachia, leave the region with diminished long-run prospects for an effective work force and for strong community leadership.

Vocational and Technical Education

Vocational education problems and needs are even more severe than those of general public education. Vocational courses, in most instances, are not offered before the tenth grade and many of the potential users of these courses have become dropouts. Those who remain to take vocational courses more often than not find themselves trained in skills for which there is no market. Richard Powers found that: "Over 60 percent of the enrollment is now [1968] in programs leading to employment in occupations that are expected to provide only five percent of the Region's jobs in 1975. Almost half of the Region's 1975 jobs are anticipated to be in

trades and industries in occupations for which only eight percent of the present enrollees are being trained." [2]

Colleges and Universities

There are a number of excellent colleges and universities in Appalachia. For the most part, they have the traditional requirements for college entrance and traditional standards and methods for rating student performance and accomplishments. Many of the institutions of higher learning in Appalachia have had little interest in the Appalachian student who needs special help to enter and to successfully complete college work. Very recently such programs as the Upward Bound Courses at Ohio University have been started to train Appalachian students not reached by the traditional approaches. The high-risk students have a better chance in a number of experimental programs, but in terms of numbers only the barest beginning has been made. The high-risk student program cannot be expanded rapidly, since its success is dependent upon a careful preparation of the faculty. Special orientation and training for the participating faculty must begin before the high-risk students arrive. How difficult it is to train a college faculty for this new role has been summarized by Benjamin W. McKendall of the College Entrance Examination Board. He said: "The entire educational system is still deeply hooked on the notion of judging students by their past, regardless of how miserable or hopeless it may have been, rather than on their future and their promise. Countless colleges issue prior statements about their concern for the urban poor, but insist on a rigid grade average or test requirements as if these numerical benchmarks were invested with a sanctity that renders them virtually infallible." [3]

Implications for Economic Development

The state development plans give top priority to educational improvements. These efforts cannot be expected to bear immediate fruit, but will make it increasingly possible for industry to look to Appalachia as a potential site where workers can be found. For immediate needs, trained labor in Appalachia can often be supplied from the large group of migrants who wish to return to their home areas in Appalachia,

or from the unemployed and underemployed who have acquired skills. Probably the most important aspect of the educational improvements now being made relates to the quality of future community leadership in Appalachia.

5. HEALTH

Among the major problems of Appalachia is the poor health of the people. Some of the highest mortality rates from tuberculosis in the nation are found in Appalachia, particularly in southern West Virginia and eastern Kentucky. Venereal disease is commonplace in Appalachia and usually goes untreated. Blindness in children from this cause is common. Many mentally retarded persons in the Appalachian population are one of the consequences of widespread and untreated venereal infection.

There are many evidences of Appalachia's desperate health needs: infant mortality in many areas is twice the national average; and deaths from infectious diseases are about 33 percent higher than the U.S. rate.

There are many reasons for poor health in Appalachia. Private and community water supplies are often polluted. Adequate sewage treatment plants are few and thousands of small hamlets dump untreated sewage into streams. Another side of the health picture is the shortage of doctors, nurses and hospital beds in Appalachia. In 1962, Appalachia's physician-population ratio was 92 for every 100,000 persons -- 34 percent less than the national average of almost 140.

The Appalachian Regional Commission and the Appalachian States are planning improvements in the health posture of the region. In the past three years, the Commission has approved 173 new health and medical facilities and 114 water pollution and sewage treatment projects to improve environmental health.

The water resource plan presented here is closely connected with some of the health problems of Appalachia. Water supply for many growing cities is provided. The added water needed in streams to assist in waste removal is

provided, with estimates of the need for treatment works to keep stream flows usable for a wider range of water uses.

6. PHYSICAL ENVIRONMENT

The physical environments of Northern and Central Appalachia (see Chapter 2 and Figure 2-1 for definition) are distinct impediments to development; Southern Appalachia and the Appalachian Highlands are less, but still, influenced negatively by man's past activities in wood-cutting, mining and exploitive investment. Not only is the rugged topography of Appalachia a hindrance to growth, but also past economic activities have created an environment in the affected areas basically unfavorable for further investment.

Nearly all of the virgin forests of Appalachia have been cut over and in all but Northern Appalachia this has occurred in the past seven decades. Furthermore, too little of the

cutting was performed in accordance with good forest management practices. Hence the second growth forests that followed are still often lacking in merchantable saw timber and, in the period before the new forests were effective, patterns of continuing erosion were firmly established.

Therefore Appalachia's smaller streams are often choked with sediment, and are flood-prone and unstable. In view of other topographic restraints, described above, small communities throughout Appalachia have a hesitant appearance merely from the threat of floods.

But Northern and Central Appalachia have also been blessed, and cursed, by extremely valuable coal deposits, many unfortunately at relatively shallow depths. The industrial revolution in the United States early consumed the coastal coal and ore deposits and, with the introduction of canals and railroads, Pennsylvania, particularly, and its neighboring



Erosion in Appalachian Mississippi

states experienced single industry community development based either on coal or an associated basic manufacture.

Later, within this century and especially since the 1920's, similar pressures opened the coal deposits of Central Appalachia, but without the associated industry. The southern metallurgical coal is shipped to the older steel-making centers and those on the Great Lakes.

Mining is always an environmental changing activity, and coal mining is perhaps the greatest villain, for it affects the environment both directly and, through the miner, indirectly. Whether by deep or surface mining, great piles of waste materials are produced. Because the coal measures frequently entrap and are covered by strata containing sulphur bearing ores, the mines and refuse piles often produce a strong acid effluent, and in all cases greatly increase the mineralization of the surface waters, and make revegetation difficult.

Moreover, until recently, miners have been grossly underpaid and often have been found to live in "company towns" -- for which neither the company nor the occupants had any community spirit. Throughout the Appalachian coal fields the visitor sees the results of marginal coal-mining investments: run-down communities, junk and trash strewn along the streams, abandoned coal tipples, great piles of coal refuse and steel slag which often catch fire and burn for years, streams clogged with silt and "yellow boy", and dispirited settlements.

Since World War II and the development of great and efficient earth-moving machinery, the new threat of extensive surface mining has hit Appalachia. Removal of about 100 feet of earth and rock over the coal always produces major terrestrial change, but when this is done in other than flat or gently rolling topography the changes can be disastrous. The affected Appalachian States have all recently enacted laws to control strip-mining in precipitous terrain, but it remains to be seen how effective these laws will be in all the States. Nevertheless major areas of Appalachia have already been defaced by surface mining high on the hills. With no place to

cast the overburden than downhill, sediment damages have been enormous. The resulting benches disfigure the environment and it will often take many decades before the scars are covered naturally with vegetation. Often acid mine drainage is increased.

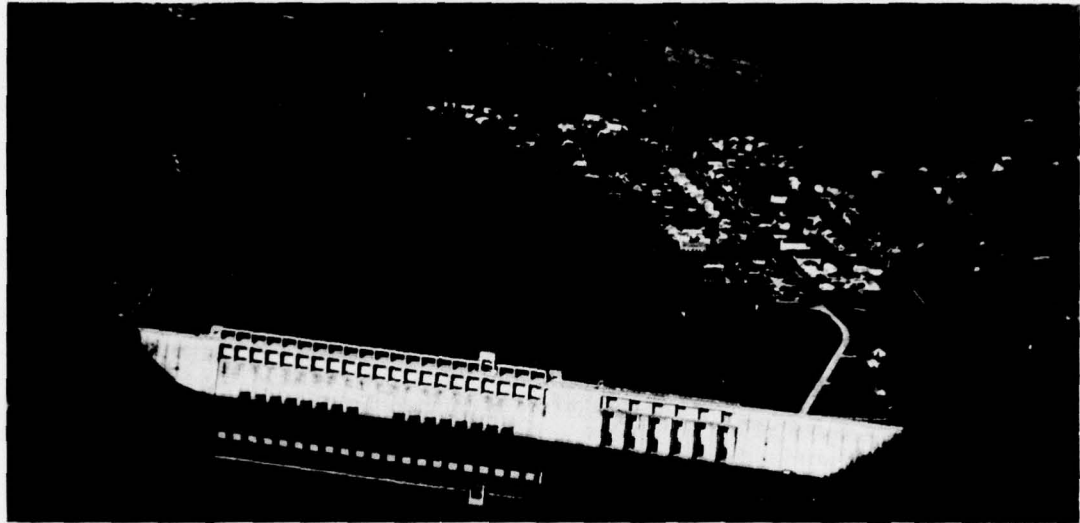
Recently the Appalachian Regional Commission, as directed by the Amendments of 1967, has issued its report, *Acid Mine Drainage in Appalachia*, which addresses the costs and benefits of curing this one aspect of environmental degradation. The Commission's conclusions are that acid drainage is a sub-regional problem and that the direct benefits of abating it are considerably less than the costs. Nevertheless, the Commission found that the deleterious effects on environmental and social values, and on the recreation potential, warranted continuing but selective programs to cure acid waters, but only as a part of major watershed and valley rejuvenations.

Numerous federal assistance programs are available which, with appropriate state and local supplementary funds and primary direction, can be applied to make a concerted attack on all environmental problems in any selected area. Certainly no valley can again become fully attractive if its stream is polluted and cannot support a natural fishery. Conversely, few outdoorsmen can appreciate a clean stream in a valley crammed with visual pollution, and with trash piled on the river banks.

Therefore, water-related activities, including land treatment programs of State and Federal agencies, to cure the environmental ills of Appalachia are both an important but interdependent part of any well designed total program to lift a specific locality out of its doldrums.

7. WATER RESOURCES

It is the purpose of this chapter to draw attention to the many ways in which the water resource problems of Appalachia are related to other outstanding problems and needs, and thus to the "package" of development efforts which will clearly be required to economically mobilize this region.



Bluestone Dam at Hinton, West Virginia

The goods and services delivered by a carefully designed water project can seldom be considered as directly creating new jobs or sharply increasing regional income. Water management investments add to the infrastructure and usually play a contributory role in "creating [that] favorable economic environment" which is necessary for growth and development. Newly provided water goods and services are consumed by users who then, no longer constrained by the lack of them, can plan and undertake new investments that provide long-term opportunities.

Such is also true of other infrastructure investments, such as in highways and airports, whereas investments in human resources—in health, education and training—do lead much more directly to increased regional income. Yet, to foster growth in an underdeveloped region, simultaneous upgrading of both the labor force and the infrastructure are often required.

In Appalachia, the new highway program improves possibilities of planning new town sites, new industrial parks, and new tourist centers; and the programs to improve the human resources are underway. Water development will often be necessary to realize the full advantages of these and similar investments.

The needed educational levels in Appalachia will probably be achieved only as the settlement pattern is made more efficient. In much of Appalachia, it is difficult for students to reach consolidated schools from the hollows and draws where they live. It is equally difficult to bring adequate facilities to the isolated settlements. Plans for servicing reorganized settlements will require a host of new resource arrangements in which water may have a significant and sometimes controlling position. The point is that water needs cannot be viewed in the abstract, but find their place beside the needs in other fields.

References:

- [1] Branscome, James, "The Crisis of Appalachian Youth," *Appalachia*. Vol. 2, No. 8 (May 1969), Page 16.
- [2] Report on a survey instituted by the Appalachian Regional Commission's Education Advisory Committee. See "Vocational Education Needs Defined," *Appalachia*, Vol. 1, No. 11, (August 1968), pp 28-29.
- [3] Branscome, *op. cit.*, p. 16.

CHAPTER 4 - WATER RESOURCES DEVELOPMENT NEEDS

1. BASIS FOR DEFINITION OF NEEDS

The water resources needs presented below, in general, are deficiencies in present levels of water management and control that form constraints to economic growth in the designated growth centers. These estimates are residual and dynamic, based on the benchmark projections of population and employment, and the premise that the active water resources projects now authorized or in the preconstruction planning stage will be in service by 1980. These water resources needs relate to: flood protection; water supply; electric power generation; water quality improvement; water-oriented recreation; navigation; drainage; irrigation; and land treatment and conservation. A summary of the projected needs for the various sub-regions is presented in this chapter.

The remainder of this report describes these specific problems and needs, and their resolution. The details of the needs are contained in Chapters 1 through 20 of Part II, Sub-regional Plans, and in the Appendices. There are many problems in Appalachia that involve flood damage, water supply, water quality improvement, recreation, and so forth, that are not discussed in this report. These problems apply to communities that are not presently

identified as growth centers, and to rural areas. When possible, problems outside growth centers are described, and probable solutions indicated.

There are two demands on the water resources of the Region which are currently beyond resolution, but which will be resolved over time. First are the implications of the projected demand for electric power generation -- whether met by conventional or pumped storage hydroelectric methods, or by thermal (fissile or fossil fuel) steam generation, these requiring cooling either by heat exchange with flowing streams or by evaporative consumption, or both. Second is the projected demand for water-oriented recreation.

2. ELECTRIC POWER, REGION-WIDE

Future electric power requirements for the Appalachian Region have been estimated by the Federal Power Commission (FPC) and are summarized in Appendix B. The demand for electrical energy in 1980 will be about 3-1/2 times the 1960 use, and the demand will continue to increase about seven-fold again by 2020. The estimates for the Appalachian Region under developmental benchmark growth projections are summarized in Table 4-1.

TABLE 4-1

ESTIMATED FUTURE ELECTRIC POWER REQUIREMENTS IN APPALACHIA

Year	Energy for Load (gwh*)	Peak Demand (mw*)	Load Factor (percent)
1970	177,000	32,000	63.0
1975	248,500	44,700	63.5
1980	340,000	60,700	63.9
1985	459,000	82,400	63.6
1990	615,000	109,600	64.0
2000	984,000	173,800	64.6
2020	2,460,000	430,000	65.4

* gwh = gigawatt-hour; a gigawatt equals 1,000,000 kilowatts, or 1,000 megawatts (mw).

The FPC estimates for the Appalachian Region are based on both past use data and on projections for future demand in 15 power supply areas in which portions of Appalachia lie. The 15 power supply areas cover most of the United States east of the eighty-eighth meridian which roughly passes through Mobile and Chicago. Peak demand in these power supply areas is expected to reach 233 gigawatts (gw) by 1980, 662 gw by 2000, and 1,614 gw by 2020.

Installed capacity, some existing and some yet to be provided, to meet the need for the 15 power supply areas would require some reserve capacity and some retirements as time progresses. The Federal Power Commission, in its Appendix B, has estimated the needed supply, based on estimates of the supply which will be available in 1970, and the additional supply which will be needed subsequently. The results of these estimates are shown in Table 4-2.

TABLE 4-2
ESTIMATED FUTURE ELECTRIC POWER
REQUIREMENTS AND CAPACITY SUPPLY NEEDS
(15 POWER SUPPLY AREAS)

Item	Millions of Killowatts (gw)				
	1970	1980	1990	2000	2020
Supply for load	123	234	418	662	1,614
For reserves*	18	35	63	99	242
For retirements**	-	0	11	19	77
Total needed	141	269	492	780	1,933
Supply available ***	145	145	269	492	780
Additional needed****	-	124	223	288	1,153
High load factor portion (80 percent)	-	99	178	230	922
Low load factor portion (20 percent)	-	25	45	58	231

* Fifteen percent of load adopted.

** Four percent per decade of previous load and reserve. None assumed for 1980, and adjusted for 2020 to account for two decades.

*** Amount after 1970 is that available for last decade.

**** Amount needed to be added over previous amount.

Electric energy needed to meet future increased power requirements will be provided chiefly by base load thermal electric generating plants, and by peak load conventional and pumped storage hydroelectric plants. The thermal electric plants require large quantities of water for steam condensing purposes. The hydroelectric plants must be located in waterways having adequate topographic relief and flow for the feasible production of energy. Both the terrain and water resources are available in Appalachia, and can be developed for the production of both peak load and base load electric power supply, or combinations of both. Because of the availability of potential hydroelectric sites and fuel and

water for thermal generation, it is reasonable to assume that a large part of the future power requirements of the 15 power supply areas will be located in the Appalachian Region. About 26 percent of the demand within the 15 power supply areas, it is estimated, will be in Appalachia. However, because of the terrain and the availability of fuel and cooling water, as much as 40 percent of the total required future power generating capacity may be installed in the Region.

Cooling water requirements for the thermal increments of this added generating capacity must be provided for as the Region's water

resources are developed. If all increased power plants added after 1970 were thermal, and all cooling of this added generation capability were to be achieved by evaporation, as in hyperbolic towers or lagoons, about 365,000 acre-feet would be consumed annually in Appalachia in 1980, 1,000,000 acre-feet in 1990, 1,840,000 acre-feet in 2000, and 5,200,000 acre-feet in 2020. This latter number represents about 3 percent of average annual flows, but may represent a considerably higher proportion of flow on an individual stream during a drought.

Currently, cooling is largely accomplished by pumping water from streams through surface condensers, the amount of water required varying with the amount of temperature rise permitted in the source by state agencies concerned with disturbance of ecological balance. For each gigawatt of electric power about 19,000 cfs of flow is required if the temperature rise is limited to 1 degree Fahrenheit. If limited to 10 degrees, 1,900 cfs is required.

Fortunately, there are many sites in Appalachia that have a potential for development of pump-back hydroelectric generation. In view of the above problems of thermal cooling and the environmental challenge posed, it is probable that as much as 20 percent of the additional installed capacity required will be provided in this way and lessen the peak demand for cooling water.

Since the demands for cooling water in conjunction with future electric power demands are so large, comprehensive studies will soon be needed in order to predetermine where future thermal installations should be located, how cooling at each location is to be achieved in view of the environmental effects, and to derive a plan for fitting cooling water use in with use of stream flows for other industrial and for municipal purposes. A further complication is that nuclear plants require from 37 to 50 percent more cooling water than fossil fuel plants. There are presently institutional, and even statutory, barriers to the conduct of planning for the locations of thermal electric plants. These must first be resolved before the planning envisaged can be effective.

3. RECREATION, REGION-WIDE

The national demand for opportunities for outdoor recreation has grown quite rapidly during the past 20 years. This high demand has resulted from increased urbanization, higher incomes, fewer hours of work per day and fewer days in the workweek, longer paid vacations, and improved transportation facilities available to the family.

About 70 percent of the population of the United States lives within a day's drive of some part of the Appalachian Region, a region that has much attraction for people seeking recreation outlets. Appalachia offers mountains, free-flowing streams, a few lakes, many artificial impoundments, and extensive forest lands. These lands and waters offer beautiful scenery, hiking, camping, skiing (both snow and water), fishing, hunting, boating, and picnicking. As the highway networks continue to be improved, easy access can be had to nearly all portions by automobile.

Certain outdoor recreation activities require water surfaces, either free-flowing or impounded. These are boating, swimming, water skiing, fishing, and waterfowl hunting. Most other outdoor activities, while enhanced by the presence of water, are not entirely dependent on it.

A study of the recreation needs in, and demands on, the Appalachian Region has been made by the Bureau of Outdoor Recreation (BOR) as a part of this investigation, based in part on the state-wide outdoor recreation plans which served as focal points in showing needs. The detailed information derived is contained in Appendix F, Recreation and Aesthetics. Much of the estimated increased demand will come from outside the Region, and about 20 percent of the total will be water-oriented.

BOR estimated that if the rate of demand for water related activities continues, and is met at the same intensities of use as at present, an additional 1-1/4 million acres of water surface in Appalachia will be needed by 1980. Because this represents placing an additional one percent of the Region's lands under water, and because the



Camping is Popular Throughout Appalachia

projections of increased per capita incomes and doubled population by 2020 imply a 4- or 5-fold increase in needs by that time, the immensity of the problem of meeting recreation needs in Appalachia is apparent.

Except for those Appalachians who live in metropolitan areas, and especially for those who live in Pittsburgh, there are ample, though often unsophisticated, water-oriented recreation opportunities available at no great distance. By 1980 Appalachia will offer a quite large and wide distribution of impoundments (see Chapter 6). Nevertheless, most of these will often be nearly unacceptably crowded on weekends and holidays through the combination of intra- and extra-regional visitors. Unless a remedy is found, the recreation experiences will be devalued, and Appalachia will lose in attractiveness. Present plans of federal, state and local agencies do not adequately meet 1980 projected needs, much less those which may evolve by 2020.

There are provisions in the Federal Water Project Recreation Act of 1965 (PL 89-72) that discourage federal participation in reservoir construction largely or solely for recreation, although, paradoxically, located reservoirs near

urban centers - - for whatever purposes - - meet recreation needs so effectively that it is difficult to plan such reservoirs under these limitations.

These facts suggest that a Region-wide survey of all recreation potentials is needed and that local development districts, and all other non-urban Appalachians who have land use planning responsibilities, have some hard decisions to make. Those who live in scenic areas can quite properly consider recreation as an industry [1] - - although one with low wages and seasonal employment - - to be sought out or rejected much as a community would decide on a new pulp and paper plant. Options available in any area are to resist, to ignore, to accommodate or to encourage recreation visitation. Based on time-proximity to demand centers and the environmental characteristics of each area, those which opt for accommodation or encouragement must also decide the mix of facilities to be provided, ranging from day-use through camping to vacation lodges and homes, noting that some aspects of each will inhibit another.

The current Appalachian Highlands Recreation Study (See Page 1-2-9) is centered on

14 terminal complexes selected because each has great aesthetic values, good access, and considerable public lands (usually including reservoirs) on which public funds could be expended to provide recreation facilities. The studies will determine market (visitation) expectations and will develop designs for both public and private investments to make each complex an attractive and profitable vacation center.

Other areas which lack a federal reservoir or other extensive public land holdings, but which would opt to encourage recreation, can zone land uses to eliminate visual pollution and increase the attractiveness of scenic assets, and assemble public and private capital to provide facilities to attract and hold the visiting public. Relatively inexpensive lakes and ponds can greatly enhance expectations, and there are a number of federal and state aid programs that can assist in meeting costs. However, inundations of valleys exclude their lands from other uses and imply decisions to forego other, possibly more remunerative, opportunities.

The proposed Region-wide survey will take considerable time, involving many democratically arrived at public, and numerous private, decisions. In addition, careful studies of the possibilities for improved utilization of existing public facilities, reappraisal of the recreation plans for existing reservoirs, improvement in water quality management and access to enable greater use of existing rivers, streams, and impoundments, and increased recreational developments in the National Forests are needed. Yet only by such methods can the full regional potential be determined, permitting proper policy decisions concerning whether to increase supply or to place limits on demand, or both.

In view of the above, this Survey has hedged against firm adoption of BOR's preliminary estimate of needs until the magnitude of costs in terms of foregone opportunities can be estimated. Thus, findings in this report, like those of BOR, are projected against near-term needs, although each project in Part III has been evaluated for the recreation demands that can reasonably be expected and satisfied over the project life.

4. LAND TREATMENT, REGION-WIDE

Inadequate conservation practices on farms and exploitation of forest resources have resulted in deterioration of the soil resources of Appalachia and created areas which continue to erode. In more recent years extensive strip mining has created many new areas where erosion is rapid and where damages are produced at some distance from the source. The Department of Agriculture's Appendix A, Agriculture, Forestry and Conservation, addresses the needs for an accelerated land treatment program -- in addition to its going programs, including that authorized by Sec. 203 of Appalachian Regional Development Act of 1965 (PL 89-4).

5. WATER SUB-REGION A (See Figure I-2, page I-1-5)

In Water Sub-region A the major problem, now and in 1980, is the pollution, from both mine drainage and sediment, of the Lackawanna and Susquehanna Rivers in the Scranton - Wilkes-Barre reaches. Associated with the degradation of the streams is an overall need for environmental improvements. Although there is fairly heavy flooding, and economic losses are significant, floods are not now a constraint to growth since there are developable lands not subject to flooding. In the Poconos, and in some of the smaller communities, flood problems have been identified. Water supply problems may develop prior to the end of this century. Acceleration of conservation practices on the agricultural and other lands, improved management of forest lands, and accelerated reclamation of strip mined lands are needed to increase production of food and fiber, and to provide lands for recreation purposes.

6. WATER SUB-REGION B

Water Sub-Region B is largely in the Susquehanna River Basin, with a considerable portion in the Potomac River Basin, and smaller portions in the Ohio, Delaware, Oswego, Hudson and Genesee River Basins. Flooding is expected to constrain industrial growth along the Susquehanna River in New York State and in the Commonwealth of Pennsylvania at several areas, such as in and around Binghamton, Williamsport,

Milton, and Sunbury. Flooding along the South Branch of the Potomac River hampers industrial growth in the Petersburg-Moorefield reach in West Virginia.

Many cities and communities in this sub-region will soon experience a shortage of municipal and industrial water. In most cases the problem is local and can be solved by expansion of existing well fields, or the development of new, because ground water is abundant in this sub-region. Water supply intakes can also be developed on most of the streams, and water removed by pumping.

A serious problem in much of Water Sub-region B is stream pollution from mine drainage and from municipal and industrial wastes. The Tioga, West Branch Susquehanna, Casselman, and North Branch Potomac Rivers and their tributaries have a high degree of acidity from mine drainage. The North Branch Potomac River and many portions of the Susquehanna near population centers are subject to municipal and industrial pollution, as are many tributaries to these streams.

Acceleration of conservation practices on the agricultural and other lands, improved management of forest lands, and accelerated reclamation of strip mined lands are needed to increase production of food and fiber, and to provide lands for recreation purposes.

7. WATER SUB-REGION C

Water Sub-region C is drained by the headwaters of the James River. Large portions of the sub-region lie in the George Washington and the Jefferson National Forests. The bulk of the sub-region's industry is located in the Alleghany - Clifton Forge - Covington Area while Botetourt and Craig Counties are oriented toward the Roanoke Metropolitan Area and are becoming increasingly important as "bedroom communities" for Roanoke. Bath and Highland counties are very sparsely populated and are oriented toward recreation and forest related activities. It is expected that these two counties with their large expanses of natural forest lands will become increasingly important as recreation outlets for the Roanoke area and the developing Shenandoah Valley area to the east.

Although most of the sub-region's water needs will be met by the Gathright Reservoir, this sub-region represents a potential source for meeting the water quality, water supply, and the flood control needs of contiguous areas.

8. WATER SUB-REGION D

Water Sub-region D lies in the drainage of the Yadkin-Pee Dee River and the headwater tributaries of the Santee, Savannah, and Altamaha Rivers. Some flooding is, and will continue to be, experienced on these streams. However, it does not constrain growth except along the upper reaches of the Yadkin River, in the Wilkesboro-North Wilkesboro and Elkin-Jonesville centers in particular, where the only lands that are sufficiently level to permit industrial expansion are in the flood plains. Athens, Georgia, located on the edge of Appalachia, is experiencing flood damages at present, and future development trends posit increasing hazard. Other flood problems are relatively minor, falling largely into local drainage problems.

Industrial and commercial enterprises in this sub-region have been expanding rapidly, and are expected to continue. Consequently, nearly all growth centers will require municipal and industrial water in amounts greater than the yield of present sources, possibly requiring major diversions. With expansion of industrial and commercial activity, and expected population increases, water quality problems will occur unless remedial measures are planned and implemented. Acceleration of conservation practices on the agricultural and other lands, and improved management of forest lands are needed to increase production of food and fiber, and to provide lands for recreation purposes. The increased population, within the sub-region and in contiguous areas, will create a large demand for recreation opportunities, both water-oriented and park-playground types.

9. WATER SUB-REGION E

Most of Water Sub-region E drains to the Gulf of Mexico through the Chattahoochee, Alabama, Black Warrior, Tombigbee, Pearl, and Pascagoula Rivers. Small parts are drained by the Oconee and Ocmulgee Rivers in the east, the

Tennessee River in the north, and the Mississippi River, which drains the western edge. There are more than 75,000 acres of land along the main streams and principal tributaries subject to flooding. Flood problems exist in the Dalton-Calhoun-Rome, Georgia growth area; the Gadsden-Anniston, Birmingham, and Tuscaloosa growth areas in Alabama; and the Columbus growth area in Mississippi. Erosion control through acceleration of conservation practices on agricultural and other lands, and improved management of forest lands are associated needs throughout the sub-region. Many upstream areas will require project type action to meet water resource needs and development.

Generally, natural water supply is adequate to meet foreseeable purposes, although a few impoundments will be necessary for its development. The Dalton-Calhoun area is now using water at a rate exceeding the record low flow of the Conasauga River, from which it obtains its supply. Unless an impoundment is constructed soon, so that the potential yield of the stream can be developed, industrial activities in this growth center will be seriously hampered. Other cities where impoundments will probably be required to meet needs, perhaps even prior to 1980, are Cedartown-Rockmart, Carrollton-Bremen, and Anniston in the Coosa River basin, Birmingham in the Black Warrior River basin, and Fayette-Vernon-Hamilton, Alabama, in the Tombigbee River basin.

Many of the streams in this sub-region already need quality improvement. Pollution problems largely result from paper and textile manufacturing, and from municipal wastes.

Slack-water navigation is available on the Black Warrior River to Port Birmingham and is expected soon to be available on the Alabama River as far upstream as Montgomery. A connection between the Black Warrior and the Tennessee, along the Tombigbee, has been authorized and is now in the preconstruction planning stage; its completion is a vital need to the Mississippi portion of the region. Extension of navigation from the Alabama along the Coosa as far upstream as Rome, Georgia is needed in the near future.

Development of public port facilities in the northeast Mississippi area would enable the

sub-region to benefit directly from the existing Tennessee River waterway. A port in this area would also serve traffic on the Tennessee-Tombigbee waterway when completed.

10. WATER SUB-REGION F

Water Sub-region F lies within the Ohio River Basin, including the Monongahela and Allegheny Rivers, with small portions drained by the Little Kanawha River, Tioga and West Branch Susquehanna Rivers, and by the Genesee River and small tributaries of Lake Erie. One of the constraints to industrial development is relatively frequent flooding by these streams. The average annual flood damage is expected to exceed 10 million dollars by 1980. Much of the area has little land available for industrial expansion except in the flood plains; flooding along the Allegheny, Monongahela, Beaver, Youghiogheny, Kiskiminetas and Upper Ohio Rivers in the Pittsburgh area seriously hampers new industrial development and the potentials for industrial diversification. This constraint exists to some extent over the entire sub-region.

Water supply for municipal and industrial use is not a serious problem in this sub-region, but considerable expansion of treatment and distribution facilities is required. Ground water storage is generally adequate in the New York portion. Upland areas can generally develop impoundments on small tributaries with little difficulty and normally at a lower cost than pumping and conveyance from the nearest of the main streams.

The need for water quality improvement is extensive because of pollution from municipal and industrial wastes as well as from mine drainage. The extent of mine drainage pollution is shown in Appendix C, and is particularly persistent in this sub-region. Pollution due to municipal and industrial wastes is discussed in Appendix D.

Acceleration of conservation practices on the agricultural and other lands, improved management of forest lands, and accelerated reclamation of strip mined lands are needed to increase production of food and fiber, and to provide lands for recreation purposes. Facilities for general and water-oriented recreation are particularly deficient in this area.



Stripmined Lands in Southwestern Pennsylvania

11. WATER SUB-REGION G

Water Sub-region G is entirely in the Ohio River Basin. The major tributaries are the Muskingum, Hocking, Scioto, Little Miami, Licking, Big Sandy, Kanawha, and Little Kanawha Rivers. Because of topographic characteristics, most of the growth centers in this water sub-region are located on flood plain lands. Average annual flood damages amount to about \$25 million. Since there is little land in the sub-region that is suitable for industry and commerce, except for these flood plain lands, their development must continue. A higher degree of flood protection, along with adoption of management plans, is urgently required along, and south of, the Ohio River if more rapid or extensive development is to be achieved. Because of the topography and the costs of relocating the roads and railroads which occupy the valleys,

only limited protection normally can be provided by individual impoundments. Yet the entire system of Ohio tributary reservoirs, when installed, will lower the height and cost of the needed supplementary protection works, permitting much needed development along the main stem and in the lower reaches of the major tributaries.

About 185,000 acres of the sub-region, including strip mined land, are in immediate need of erosion control and reclamation. General conservation practices are needed on agricultural and other lands. A combination of management and conservation practices is needed on the forest lands to preserve and develop them.

Most of the major streams and many of the minor tributaries in this water sub-region already need water quality improvement.

Pollution results from partially treated municipal and industrial wastes and from mine drainage.

Water supply use in the sub-region is expected to increase five-fold by 2020. Since most of the growth centers are located on major tributaries, meeting their needs is largely a matter of controlling stream quality and expanding withdrawal and treatment facilities. However, because a few growth centers are located high in the watersheds, some future water supply needs will probably require impoundments.

12. WATER SUB-REGION H

Water Sub-Region H is partly drained by the Licking, but mostly by the Kentucky River. The growth centers along the Licking River and along the Kentucky River and its major tributary, the Red River, experience high average annual flood damages. At Hazard, this frequent flooding acts as a constraint to growth since the limited lands yet to be developed lie in the flood plain. A large portion of the developable lands at Midland (a new town being planned) are in the flood plain below Cave Run Reservoir. In most cases there are adequate amounts of developable lands near the growth centers, major exceptions being Hazard and Midland.

There is much need for the acceleration of conservation and forest improvement and for strip mine reclamation programs in the entire sub-region.

Water supply needs by 2020 are expected to treble present use; however, the projects that are expected to be operating by 1980 will generally be adequate for these needs. There are stream quality problems created by both dissolved and solid materials from mine drainage, and by municipal and domestic wastes. These problems exist in the major streams and in the smaller tributaries into which wastes are emptied, even upstream in some of the small creeks that are intermittent.

13. WATER SUB-REGION I

Water Sub-region I is located largely in the Cumberland River Basin, with minor portions

drained by the Kentucky, Green and Tennessee Rivers. In most of the growth centers in this water sub-region, flooding is not a constraint to growth, and much of what does occur can be classified as a local drainage problem. The exception is Harlan, Kentucky, where flood protection is a serious need. Except at Harlan and Pineville there are adequate flood free lands for industrial, commercial and residential expansion. Acceleration of conservation practices on the agricultural and other lands, and improved management of forest lands are needed to increase production of food and fiber, and to provide lands for recreation purposes.

Water supply for municipal and industrial use should be adequate by 1980 at all growth centers. Pumping, treatment, and distribution facilities throughout the sub-region will need expansion, but, in most cases, new water supply sources will not be needed. There is some pollution, from both municipal wastes and mine drainage, in the upstream portion of the Cumberland River and in some of its tributaries.

The extension of navigation through Cordell Hull Reservoir and on upstream would encourage the development of both coal and zinc mining in this portion of the water sub-region.

14. WATER SUB-REGION J

Water Sub-region J is almost entirely in the Tennessee River Basin, the one significant exception being the headwater tributaries of the Levisa Fork of the Big Sandy in Virginia. Although the Tennessee River and some of its major tributaries are rather fully developed for flood control, navigation and conventional hydropower, there remain several kinds of water and related resource investments which can contribute toward economic growth and development if they are designed as to serve the sub-region's changing needs and potentials.

The availability of navigation in combination with good rail and highway facilities, flood-free plant sites, and a large dependable water supply has attracted much industry to the Tennessee River waterway. Increasingly, these developments are depleting



Flooding at Oliver Springs, Tennessee

the supply of readily developable major sites. Extensions of channel, and of railroad or highway facilities, will be required to maintain an adequate supply of these sites to continue growth of their higher-wage industries.

Although one of the sub-region's assets is an abundance of clean water, there are certain stream reaches where the volume and kind of existing and projected waste discharges will restrict water use and inhibit development of the area. Two of these areas with water quality problems are the French Broad River in North Carolina and the North Fork Holston River in Virginia. Water supply to meet foreseeable industrial and municipal needs at major growth centers is generally available, but storage may be required to regulate seasonal flows where tributary streams are the source of supply.

Reference:

- [1] Robert R. Nathan Associates, Inc. *Recreation As An Industry*, Prepared for the Appalachian Regional Commission, Washington, D. C., Dec. 1966.

Flooding from tributary streams is a problem of varying degrees at most of the growth centers in the sub-region. The orderly development of these areas requires continued consideration of flood damage problems and appropriate damage prevention measures. Although flood plain information studies have been published for most of the affected communities, and many have adopted varying degrees of flood plain regulations, there is a continuing need for effective regulation. Investment in local protection works is indicated in some cases.

As in much of the remainder of Appalachia, there is need for continued attention to environmental improvement and for investment in recreational facilities in key locations. Continued emphasis on proper management of both rural and urban water-related lands will contribute to maintaining a quality environment as the sub-region develops further.

CHAPTER 5 - FORMULATING THE APPALACHIAN WATER RESOURCES PLAN

SECTION I - KEY DECISIONS CONCERNING PROJECTS

1. INTRODUCTION

In this Chapter there are two Sections. The first is concerned with key program and project decisions; and the second, with the overall influences that shaped these decisions, and the plan itself.

A plan without programs and projects cannot be carried out, save in the future when such spring forth from a continuing planning process. Projects are the culmination of planning.

The Appalachian Water Resources Survey (AWRS) was triggered in 1964 when the Congress wrote Section 206 into the pending Appalachian bill. The intent of the law is clearly to call for recommendation of water resources development projects which are sensitive to regional economic development.

In this Survey over 100 major projects, representing various water development programs, were proposed at various times. Some lacked promise of helping to initiate regional economic development. Others failed when measured against one of the other four screening criteria detailed below. Some are not now carried forward for early action simply because means were not available to perfect them under the time restrictions of this report; in such cases they are recommended for early investigation.

There are a number of constraints that operated to restrict the scope of the Plan presented here. These stem from procedural or statutory policies, or from the absence of such policies. These constraints are also discussed in Section II of this Chapter.

2. GUIDELINES IN FORMULATION

A large program for water resource development in Appalachia has been underway for several decades. The Federal Government, the state and city governments, and many private groups are contributing to this effort according to their several interests and capabilities. A major objective of the plan here discussed is to

selectively strengthen and to supplement this on-going program, recognizing that it stems from a complex mix of goals, objectives and means. In realizing this objective the guiding principle has been to strive for economically feasible water resource developments that, with other programs for providing public facilities, will act as catalysts to both regional and national economic changes, such changes including investments by the private sector as well as complementary public plans and actions.

In summary, the goal of the Appalachian Water Resources Survey (AWRS) is to delimit those opportunities for water resource investment which appear to be sensitive to early stimulation and nourishment of the regional economic development process. This can be recast as a concern for making those investment choices in water resources which will contribute more long term jobs and higher real wages to Appalachians. This goal can be attained most frequently also by increasing national income, since the Appalachian Region contains many resources, human and capital, which are only partially utilized. The mobilization of these resources requires the judicious application of both public and private investment since a need for additional overhead capital expenditures, and the failure, to a degree, of the market system to perfectly equate private and social gains and costs, make public action necessary.

This plan emphasizes the placement of the public water dollar where the private sector will find that the combination of water services provided (along with the remaining set of public services), and the human and physical resources indigenous to the area, create an opportunity for profitable investment. A water project may play the role of the final sufficient condition for profitable private investment if the project completes the set of necessary services; or, more commonly, the role of one of several necessary services. In this context, the role of a public water program in mobilizing the attention and energies of local citizen groups to aggressively seek private investment is very important. The form of the assurances required from local

responsible groups for public water programs is one means of insuring such activities, one of the public policy options which can be modified to encourage desirable public action by local government (see Chapter 8).

The resolution of conflicts is central to the plan formulation procedures and is achieved in many different ways, some of which are illustrated in this chapter and in the plans shown in Part II. Frequently, consideration of where the costs fall, and to whom the benefits accrue, highlights the nature of conflicts stemming from contradictory goals and divergent value systems. Furthermore, various cost sharing arrangements have evolved over time (see Chapter 8), which permit water resource development to proceed with a measure of equity between diverse interests, and to reflect a range of outputs varying from purely public values (flood control) to private goods (water supply, or power). The plan of development of water resources in Appalachia has been formulated (capitalizing on the institutional factors inherent in such cost sharing arrangements) to use the leverage from public investments to stimulate the location and magnitude of private investment decisions. Public investments are considered which offer the private sector opportunities to utilize available capital, land and labor resources more effectively.

As discussed much more fully in this report in Part IV, Concepts and Methods, this plan stresses the teamwork between public and private enterprise sectors, and between federal and state interests, to attain the objectives set forth in the Appalachian Regional Development Act of 1965 (PL 89-4). Thus, needs for water resource development are stated in terms of the developmental potential of various growth centers of the Appalachian Region, rather than the needs implied by economic projections based to a great extent on an area's performance in the past two decades. Hence the needs are greater than historical projections would support in the instances where growth potential is clearly greater than past performance.

The environmental goal of the Survey is to use water resource projects to correct environmental problems which inhibit economic growth. A preservation strategy plays only a minor role.

The criteria followed here in project selection and scale differ somewhat from those normally applied in federal water resource evaluation, mainly because the potential gains in incomes for Appalachians have been stressed, as opposed to the traditional emphasis on determining the value users would be "willing to pay" for project supplied goods and services, and comparing these to the market costs of the project. Market prices diverge from social costs in the presence of un- and underemployed resources, or in the presence of external economies or diseconomies.

The plan of development was formulated at the 3¼ percent interest rate current during fiscal years 1966-67. The subsequent increases in interest rate, up to 4-7/8 percent in FY 70, were not applied to reformulate the plan. However, the effects of these changes on costs, on performance indices, and on cost sharing, have been estimated, and are presented in Chapters 6 and 7. It is believed that the project proposals would not be substantially altered if formulation had been shifted to the 4-7/8 percent base. Project life, assumed for evaluation, was in all cases limited to 100 years, and in some cases to 50 years, and in one case to 25.

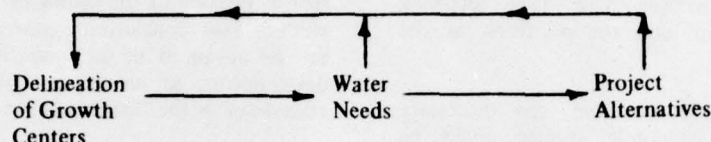
3. PLAN FORMULATION BY NEEDS CONSENSUS

A plan of development for each water sub-region was developed by nine Corps of Engineers Districts, the U.S. Department of Agriculture and the Tennessee Valley Authority from inputs generated internally, and with help from cooperating districts, and the States, and from other federal agencies. As it worked out, the *formulation process focused on building consensus from among the several value systems being brought to bear about sub-regional needs* -- rather than starting from a firm definition of needs, then considering an array of alternatives and selecting the optimal solution, as the planning process is sometimes visualized.

During the initial studies stage, only very limited projections of needs and definitions of developmental strategies were available. Preliminary benchmarks were available months after initial stage studies were due; firm commitments as to growth centers were defined

well into 1968, and resulted partly from the interaction between planners in the Commission,

the Appalachian States, and the planners in APS and elsewhere in this survey.



Thus a feedback loop was actuated which affected, to some extent, the delineation and relative ranking of growth centers. The process sharpened the conceptual validity of growth center analysis. Definition of growth centers, or nodes, in a 5-10 year time horizon differs substantially from the delineation of nodal areas of long-run potential. The focus of attention on industrial roads, water treatment, sewage treatment and many other public works activities is primarily short-run - where there is likely to be a very prompt response - while, for the delineation of corridors and other major public work projects, much longer-run impacts are decisive in decision-making.

It was the iterative and circular nature of the planning process that led to consensus about needs, the relative set of priorities about what ought to be done within a time period and, within these parameters, definite recommendations concerning projects and future studies.

4. STAGES IN THE PLANNING PROCESS

At the start, in 1965, the Office of Appalachian Studies (APS) was faced with basic data collection, and with the problem of early definition of tasks to be performed. Agreements were worked out with those federal agencies concerned with water and related resource development, but not performing construction, concerning the general nature of their contributions to this report, and the funds they would require. In these negotiations it was found that most had already assembled much basic data; hence, allocations for expenses could be limited to just the additional work required.

Similarly, each of the major water project construction agencies -- the Tennessee Valley Authority (TVA), the Soil Conservation Service (SCS), and the Corps of Engineer Districts -- was

surveyed for the status of going programs of planning, design and construction. In much of Appalachia either comprehensive surveys were underway, or basin plans had recently been published. Basic agreements were made not to re-do or hold up planning already done or well underway, but to reach out beyond the going programs, and to plan for actions which would accelerate regional economic development.

These agreements guided the writing, by APS, of the *Plan of Survey*, accepted by the full Water Development Coordinating Committee for Appalachia (WDCCA)[1] in its second meeting in February, 1966. The *Plan of Survey* specified three planning stages: (1) the initial studies, which were already underway; (2) the screening stage, to be conducted in late 1966 and early 1967; and, (3) the formulation stage, during which the tentative decisions reached in screening were to be used in the formulation of projects and plans, with the understanding that the decisions were to be tested against alternatives at every appropriate point during formulation.

This Chapter reports the critical aspects of the screening processes, and subsequent investigations, for what occurred then has had much influence on the early time frame recommendations which evolved from the plans (presented in summary form in Chapter 6, and in detail in Part II). The screening was largely of potential projects to be moved forward to detailed formulation and initial design studies, but their selection or rejection signalled the strategies for economic growth embodied in the entire plan.

The guiding criteria at the screening stage, during the winter of 1966-67, were:

- (1) Evidence that the project would be responsive to PL 89-4, with a substantial regional developmental response, including a national response.

(2) Concurrence by the appropriate state representative that the proposal would substantially further the then evolving developmental plan, and the priorities, of the state.

(3) Confidence that the necessary engineering and economic studies could be completed to survey scope level in the time frame of the survey.

(4) Judgment that possible policy deviations could be accommodated within the language and intent of the appropriate authorities, especially PL 89-4.

(5) Presence of a substantial local interest in the potential project, and willingness by non-federal interests to meet the requirements for reimbursement.

The time and funds available required that the number of projects selected be limited, and that those selected largely be projects for which considerable initial engineering design studies had already been performed. Additionally, screening necessarily had to be conducted before explicit, region-wide development strategies and local "packages" were defined, and before the system for evaluation of the regional economic impacts could be applied to each potential project.

U.S. Department of Agriculture's surveys were based on preliminary investigation and study of 198 upstream watershed areas; the USDA Conservation Needs Inventory (1958) compiled on a county basis; the Conservation Needs Inventory for Watersheds (1967) compiled for each watershed; forest resource surveys; and other special studies. Complete details are covered in Appendix A - Agriculture, Forestry, and Conservation.

A brief discussion follows of the key TVA and Corps decisions concerning definite project considerations in each water sub-region.

5. WATER SUB-REGION A

Sub-region A is drained by the Delaware and Susquehanna Rivers. A comprehensive report on the Delaware Basin was published in 1960 and implementation of the plan is underway under the guidance of the Delaware River Basin

Commission. The Susquehanna Basin is currently under study for a comprehensive interagency report. Because of the timing of the Susquehanna studies, few conclusions concerning that basin can be advanced in this plan; however, regional development, as an explicit objective, will be considered in the final report on that basin.

Because of the fairly recent completion of the Delaware River Basin plan, Philadelphia District elected to canvass each county to elicit proposals and judgments as to the nature of water resource developments which might further the objectives of PL 89-4. Baltimore District furnished the results of the planning studies for the Susquehanna. A developmental strategy for Water Sub-region A was formed in the initial studies report, based primarily on encouraging the established recreation industry in the Poconos area, and alleviating the environmental problems (the "hard coal landscape") of the anthracite coal fields.

The two projects in the Poconos, which area was already to be assisted by the Tocks Island Reservoir and the Delaware Water Gap National Recreation Area then in preconstruction planning status, were to advance the date of the authorized modification of dry-bed Prompton Reservoir to add a conservation pool for water supply and recreation, and to restore a community lake at Tobyhanna whose dam failed in the 1955 flood.

The needs in the hard coal fields were more difficult to translate into project proposals. No projects were proposed affecting the Scranton - Wilkes-Barre growth centers, simply because planning in that area had not advanced sufficiently. For that reason, an environmental study of the Lackawanna-Wyoming Valley was triggered to develop a practical strategy for water resource investments to meet the quite evident needs. Further south, in Schuylkill County, four proposals were made: at Deer Lake, restoration of a community-owned lake; in Tamaqua, a local flood control project on Wabash Creek, permitting an important urban renewal; county-wide, a water supply system for anticipated growth in municipal and industrial requirements; and a large project to correct the environmental conditions arising from mine wastes and acid in the Schuylkill River headwaters.

After screening and some subsequent studies, all but the Tamaqua project were deferred. The two lake restorations, however worthy, were dropped for the purposes of this report because no definite recommendations for federal water program participation could be made under current authorities, and because it was believed the communities could move the proposals, under state auspices, for grant-in-aid assistance. Similarly, the proposal for water supply in Schuylkill County was considered to be capable of implementation under various federal grant-in-aid programs without further evaluation in this water resources report. Later studies in the Poconos showed no gain to the Appalachian economy by advancing the scheduled 1979 date for the Prompton modification; demand for neither the water supply nor the recreation potential could be foreseen any earlier. Finally, the Schuylkill River cleanup was, and is, delayed pending evaluation of, and policy resolution concerning, the Commission's Acid Mine Drainage Report to the Congress which was required by the Appalachian Amendments of 1967.

6. WATER SUB-REGION B

Sub-region B is drained by the Susquehanna, Potomac, Delaware, Oswego, Genesee, Hudson, and tributaries of the Ohio River. A comprehensive study of the Delaware Basin was completed in 1960, and one of the Potomac Basin was completed in 1963. The Chief of Engineers forwarded a modified Potomac Report in 1969. Comprehensive interagency studies of the Susquehanna and Genesee Basins are underway, and due for completion in 1970. Thus a substantial base of engineering and economic data was available. The timing of the Susquehanna study is such that although that report will reflect the consensus of needs reached in the Appalachian Water Resources Survey, no definite plan can be advanced in this report.

The initial stage study proposals were, therefore, largely concerned with reevaluations of reservoir projects that had gained some status in earlier reports, including authorization, but which were not then fully active. Baltimore District suggested four authorized projects: Raystown and Tioga-Hammond Reservoirs in Pennsylvania, which were dropped when it developed that they

had been selected for early construction; and South Plymouth and Genegantslet Reservoirs in New York, which were dropped when New York State later stated a preference for the authorized Davenport Center Reservoir, modified to include other purposes than flood control. The Davenport Center Reservoir is being considered in the Susquehanna Study as part of the Charlotte Creek development.

Other proposals were for local protection projects at Tyrone, Pa. and Delhi, N. Y.; and the Hawk Mountain Reservoir and a series of small dams and reservoirs for water supply in Delaware County, both in New York. Hawk Mountain was recommended in the 1960 Delaware Report for future study, but was dropped when the site was rendered uneconomic by a planned highway; and the small dams were deferred pending policy decisions concerning federal interest. It was found that the Delhi LPP could be reported favorably and expedited under Section 205 of PL 87-874, and the authorized but inactive Tyrone LPP could be implemented upon provision of necessary assurances by local interests.

From the 1963 Potomac Report, Savage II, North Mountain, and Royal Glen Reservoirs were proposed. Screening of Savage II disclosed that, because it would operate essentially only for water quality with incidental recreation benefits, and because its future in the pending report was uncertain, further consideration here was not warranted. North Mountain and Little Cacopon Lakes were dropped from detailed study in this report when it was learned they would be contained in the 1969 report by the Chief of Engineers on the Potomac River. Conversely, a modified Royal Glen Reservoir, lowered 100 feet by deletion of water quality storage, showed promise of providing much stimulation to the economy of Petersburg, W. Va. and of having considerable recreation value to the authorized Seneca Rocks-Spruce Knob National Recreation Area. It was retained.

The screening process showed a need to study the potential of the recreation industry in the northern tier counties in Pennsylvania, and such a study was initiated, concluded, and used in the plans. Later the Commonwealth of Pennsylvania proposed inclusion in the sub-regional plan of the Naturealm project, a nature study and public education center based

on a peninsula in Glendale Lake in the existing state-owned Prince Gallitzin Park.

7. WATER SUB-REGION C

A comprehensive study is underway for the James River Basin. Since Water Sub-region C is essentially the headwaters area of the James River, and because formulation of the basin plan had proceeded sufficiently to identify the Hipes Reservoir as an essential increment of the basin plan, and also because the project will offer a substantial addition to the recreation industry of this section of Appalachia, Hipes was proposed for continued study in the initial stage studies. Screening stage studies confirmed the District's conclusions, and that the project fits the Commonwealth of Virginia's developmental strategy and priorities. The project package (Chapter 4, Part III, Volume 6 of this report) indicates that the Hipes Reservoir represents an effective alternative, among twenty-seven major reservoir sites evaluated, for meeting the needs of the James River Basin. The disastrous storm of August 1969, which centered approximately 60 miles from the project site, caused a loss of over 100 lives in addition to monetary losses in excess of \$100 million, and points to the urgent need for additional flood control from a project such as Hipes Reservoir.

8. WATER SUB-REGION D

Many of the large mainstem reservoir sites in Sub-region D have been developed by private utilities for hydroelectric production, with incidental water supply and recreation development occurring after construction. Comprehensive basin plans have not been made on the major river systems of the sub-region. Thus the status of planning and implementation is closely related to "308" reports, and subsequent project documents. The Charleston District has been engaged in review reports of the Yadkin-Pee Dee and the Santee River Basins for a number of years. The Savannah District has developed a number of projects on the Savannah River but, in the headwaters, the Keowee-Toxaway projects of Duke Power Company are under development.

In their initial reports, the Districts recommended study of seven reservoirs. To supplement the limited control provided by W. Kerr Scott Reservoir in the headwaters of the Yadkin River, study of Reddies River (authorized, but deferred for economic analysis), Roaring River, Mitchell River and Fisher River Reservoirs was proposed. These would serve secondary growth centers along the river, and Winston-Salem. On the Broad River of the Santee, Clinchfield Reservoir was proposed to control water supply and water quality problems in areas already growing rapidly. Savannah District proposed study of the Tallow Hill Reservoir on the Broad River of the Savannah, but later studies showed limited impact on Appalachia, causing it to be dropped. Lastly the Curry Creek Reservoir on the North Oconee River of the Altamaha, above Athens, Ga., was recommended.

Subsequent studies confirmed that Curry Creek and Clinchfield Reservoirs would provide major services to growth centers, and they have been retained in the plan. Studies on the Yadkin River showed that the authorized Reddies River Reservoir could be considered adequately evaluated to indicate positive economic feasibility, and therefore eligible for funding for preconstruction planning without further reporting. The conclusions were that Reddies should be followed by Roaring River Reservoir, and that Mitchell and Fisher Reservoirs be deferred for future study. The primary reason for delay is that the combination of Scott, Reddies, and Roaring River Reservoirs could meet all identified water needs (except recreation) until about 2010; thus net system benefits could be increased by delaying construction of the Mitchell and Fisher Reservoirs. Another reason for the priority given is that the recommended system would give a high degree of flood protection to the towns of Wilkesboro, North Wilkesboro, and Elkin-Jonesville, N. C. which experience heavy and persistent flooding, and can economically develop the relatively flood-free areas created by the reservoir system. Mitchell and Fisher River Reservoirs are located downstream from these damage centers.

9. WATER SUB-REGION E

Sub-region E is primarily drained by portions of the Savannah, Altamaha, Appalachian, Alabama and Tombigbee-Black Warrior River systems. The Oconee and Savannah Rivers in Sub-region D and the Chatahoochee in this region were reported in the Southeast River Basins study, a report of the United States Study Commission, Southeast River Basins, in 1963. No additional comprehensive river basin studies have been completed since the "308" reports of the Corps of Engineers. The historic emphasis in water resource development has been focused on hydroelectric and navigation development. Urban land-use patterns are normally on high ground, and the high rainfall and runoff provide high base flows to the streams. Hence authorities have permitted the location of many industries which discharge heavy effluent loads to the streams causing oxygen depletion, color and other forms of pollution. In common with developmental trends in Sub-region D, many fast growing areas are located relatively high in the watersheds, leading to a rapidly approaching shortage in the desired quality and quantity of water.

In view of these trends, Mobile District advanced proposals in the initial studies stage for a number of fairly large reservoirs in the headwaters of the basins to provide a large measure of regulation on the mainstems, not only for power, but also for flood control, water supply and water quality. The uncontrolled major tributaries of the Black Warrior Basin suggested the North River, Arkadelphia and Smith's Ford Dams. However, the City of Tuscaloosa was faced with an urgent water supply problem and, rather than wait for federal authorization, preempted the North River site and started construction. The Smith's Ford site on Locust Fork could not be actively considered, at that time, because it was under a license, since expired, granted by the Federal Power Commission to a rural electric cooperative. The Arkadelphia site showed some promise of abating flooding in Cordova, but was not developed as a definite project proposal in this report because sufficient resources were not available to complete the required studies.

Similarly, on the Tallapoosa River, Oakfuskee and Crooked Creek Dams were proposed, but were later dropped for lack of a clear developmental response. Also, FPC has issued a permit, still outstanding, to Alabama Power Company to study the Crooked Creek site. The authorized Gilmer Dam on the Etowah River, a Coosa River tributary, was also proposed and dropped for the same reason. Lastly, on another Coosa tributary, the Conasauga, the proposed Dalton Dam survived screening, because it will alleviate urgent water supply and water quality problems in the rapidly growing, national center for tufted textile manufacture.

When, during this survey in 1966, a construction start was appropriated for Jones Bluff Lock and Dam on the Alabama River, navigation to Montgomery was assured. In the 1958 authorizing document for the Coosa River Navigation Project, Bureau of the Budget specified that an economic reevaluation of the project would be required upon attainment of such assurance. Low cost navigation on the Coosa would serve the growth centers of Gadsden, Ala. and Rome, Ga. (and others), essentially through construction of locks in an existing series of six dams of the Alabama Power Company. The required evaluation is also part of the sub-regional plan.

A recognized need for several years within the northeastern Mississippi part of the sub-region has been for a port facility to give the area direct access to the Tennessee River waterway. Mississippi State University studied the feasibility of such a port and in 1967 reported that it was not justified based solely on usage by existing industries in the area. However, it was recognized that such a port could be planned to attract new industries and jobs as well as to serve existing industries. Interest by state and local organizations was high and a study of the potential for such a project was undertaken as a joint state-TVA effort. Results showed that the project would have a major impact on employment opportunities and led to proposal of the Yellow Creek Port Project by TVA. Implementation will involve major participation by state and local governmental agencies.

10. WATER SUB-REGION F

Sub-region F is largely drained by the Allegheny and Monongahela Rivers, but portions are also drained by the Genesee, Susquehanna and small Lake Erie tributaries. A comprehensive interagency survey is nearing completion for the Genesee River Basin, and a framework study of the Ohio River Basin covering the Allegheny and Monongahela River systems was published in 1969. No other comprehensive planning has been done in the Upper Ohio River Basin since the "308" reports. This portion of Appalachia is characterized largely by a heavy concentration of old and slow growth industries.

Against this background of trends and studies, the Buffalo District proposed a group of small, primarily recreation, boat harbors on Lake Erie for further study, and flood protection for Gowanda, N.Y., along with continued study of the Portage and Stannard Reservoirs delineated in the Genesee River Basin studies. As a result of public hearings, the Portage Reservoir Project was deferred for restudy. The Stannard Reservoir project has been carried forward in this plan because it promises to be an integral part of any final basin plan, and its low flow controls should induce a pulp and paper plant to locate downstream in an area with considerable timber resources near by.

Buffalo District also conducted studies of flood protection at Gowanda, N.Y. and, in conjunction with the consideration of alternatives, evaluated Zoar Reservoir on Cattaraugus Creek. Reservoir studies were discontinued because the effect of effluent discharge into the reservoir from the Nuclear Fuel Recovery Plant could not readily be evaluated. Studies of alternate reservoirs, Otto and Springville, are planned.

At a later suggestion by Pennsylvania, the impact of Lake Otocsin in the Susquehanna basin was studied, and the project has been incorporated in the plan. The project would provide water-oriented recreation, and some water supply, to a major tourist and vacation complex to be located along Interstate 80 in Clearfield County, entirely under State sponsorship.

The Pittsburgh District planners conducted an extensive reconnaissance of potential projects above that city, seeking improvement that would abate the water quality and flooding problems harassing the area. In their initial report they advanced a list of 28 potential reservoirs, 22 potential local protection projects, and 3 potential flood plain studies for consideration as elements of the tentative Appalachian plan. Some of the projects were in preconstruction status (estimated \$260 million first cost) while the rest were new projects (estimated \$440 million cost). Clearly, the Appalachian Water Resources Survey time and resources schedules would not permit thorough investigations of all the proposals. In common with the procedures utilized for screening, the number of proposals for survey scope investigation was reduced to that permitted by District capabilities to complete initial designs.

Finally, the St. Petersburg project was selected for further study, based on the high degree of water management control the project would add to the existing reservoir system of the Allegheny River, and to control of Pittsburgh area flood plains. One of the early defined problems associated with the St. Petersburg project was the presence of abandoned deep and strip mine areas, which also contributed acid discharge and sediment to the Clarion River. Pittsburgh District planners reasoned that control of acid mine drainage, along with other reclamation measures, could be realized at reasonable cost and these areas utilized as recreation, or buffer, areas. Here is a case where multiple-purpose water quality management on land would allow the reservoir to be more effective for other purposes. Subsequently, the impact analysis of St. Petersburg indicates that the effect of this proposal in mobilizing the resources and interests of communities located in the reservoir area towards an explicit economic development program is very significant, in addition to the effect of additional flow control on downstream development.

As to the remainder of the proposed projects, additional studies reduced them to about 20 which show considerable promise. The plan proposes their continued study, design and construction over a 30-year period.

11. WATER SUB-REGION G

Sub-region G is drained primarily by the Kanawha, Big Sandy, Muskingum, Hocking, Scioto, and Licking Rivers, all Ohio River tributaries. A comprehensive interagency study is underway in the Kanawha River Basin, and a review of the Muskingum River Basin has just been initiated, while recent basin studies have been completed on the Scioto, Hocking and Big Sandy Rivers. The sub-region displays diverse economic characteristics and a very wide range of water problems. One of the problems, especially in the portion within Central Appalachia, is that an incisive strategy of development which has broad support, by both local interests and outside experts, has not evolved. Embodied in this problem is the great difficulty of correcting certain physical and environmental difficulties without undesirable spillover effects. The problem of limited physical alternatives available to the Corps of Engineers for the reduction of flooding damages is just one example. Another facet of the argument is whether further out-migration ought to be encouraged or discouraged; and related to this, definition of a reasonably balanced economy for such areas.

The Huntington District initial studies report recommended the following projects in order of priority:

Kanawha Basin - water quality in the Charleston SMSA is the major problem.

- a. Birch Elk River (authorized)
- b. Moores Ferry, New River (authorized)
- c. Big Reed Island Creek)
- d. Little River) New River
- e. Reed Creek)
- f. Other potential projects in the Basin.

Little Kanawha Basin - flooding in the tributary and on the Ohio mainstem are the major needs in this tributary, and in the rest of this listing.

- a. West Fork (authorized)
- b. Leading Creek (authorized)

Middle Island Creek - inundation would upset an important fishery.

Symmes Creek

Big Sandy Basin, Tug Fork

- a. Panther Creek (authorized)
- b. Lower Knox Creek

Lower Ohio Brush Creek

Logan, Hocking River (authorized)

Whiteoak Creek - New Hope site

Little Muskingum River

Raccoon Creek - here a major problem also is acid mining drainage.

South Fork Hughes River, Little Kanawha River

During screening, the status of all proposed reservoir sites in the Kanawha Basin, except Birch, was determined to be dependent on resolving the application of the Appalachian Power Company for the Blue Ridge (Moore's Ferry) Project which could preclude, and would certainly modify, the needs for additional development in the New River above the existing Bluestone Reservoir. Further, an economic restudy of Birch Reservoir was already underway. Therefore, the emphasis was shifted to the unmet needs of the lower Kanawha River Basin, and the screening process recommended study on the Greenbrier River of the authorized Big Bend Reservoir, or alternatives further up in the headwaters of that tributary.

Further studies led to development of a two-reservoir system, Greenbrier and Anthony Creek, above the authorized Big Bend site on the Greenbrier River, as a potential solution complementary to both the Appalachian Water Resources Survey and the Kanawha Comprehensive Study. However, at the time of public hearing and subsequent reviews, strong opposition was experienced in relation to the rather extreme drawdown characteristics of Anthony Creek Reservoir, which would result from releases for water quality control. Although the system appeared to be amply justified both in terms of user and expansion benefits, deletion of the Anthony Creek project would require a complete reformulation of the Greenbrier Reservoir. In view of the absence of concurrence by the State of West Virginia, further studies

were deferred until the Kanawha Comprehensive Study could define the basin strategy and a tentative basin plan.

Screening of the authorized projects on the Little Kanawha showed that they met the developmental needs, and that no further action was necessary. Further analysis revealed that the needs and problems on Middle Island, Symmes, Lower Ohio Brush and Raccoon Creeks were essentially similar, and that the status of engineering studies on each was such as to preclude project design within the survey's time schedule. No reasonable developmental impact was found for a project on the Little Muskingum River, and that tributary was also deferred.

Flood control for the Tug Fork of the Big Sandy has been a continuing problem for many years. Citizen interest was, and is, high in the potential Lower Knox Creek Reservoir which was found to be infeasible economically in the 1965 Big Sandy Report. During screening, an environmental study of Logan, McDowell, and Mingo Counties, W. Va. and Pike County, Ky., in hope of better definition of the possible growth strategy for the Tug Fork Valley, was also recommended. This study, and extensive restudy of the hydrology and flood damages of the sub-basin, did not lead to significant changes in the earlier report. A full report of the conclusions is contained in Chapter 13 of Part III.

Further study of Logan Reservoir, with water supply and water quality control as added purposes, and a site on Whiteoak Creek were recommended in the screening studies. A reformulated plan for Logan Reservoir has been completed, representing a balance of purposes also favoring environmental enhancement. A project downstream from the New Hope site on Whiteoak Creek was formulated to provide additional water supply for the Georgetown, Ohio area, flood control on the mainstem Ohio River, and additional recreation for the Cincinnati Metropolitan area.

The Louisville District proposed additional studies of the Royalton Reservoir on the Upper Licking River. This proposal continued through screening studies and, subsequently, the project

was utilized as an interim report for the Appalachian Water Resources Survey to demonstrate an outstanding and unique role that water resources development may play in the economic development of a depressed region; and to test methodology for measuring expansion benefits, and the formulation procedures to be used under the developmental objectives of PL 89-4 throughout this report.

12. WATER SUB-REGION H

Sub-region H is predominantly drained by the Kentucky and Licking River Systems. Both the Upper Kentucky and Licking River basins are in Central Appalachia, typified by rugged terrain, limited developable land, difficult access, and experiencing declining employment in the major export industries of bituminous coal and forest products. A review report of the Kentucky River basin was prepared in 1958. Works installed, or under construction, include Buckhorn Reservoir on the Middle Fork of the Kentucky, Carr Fork Reservoir on a small stream above Hazard, Ky. which itself is on the North Fork of the Kentucky, and Cave Run Reservoir on the Licking. Authorized, and in the preconstruction planning stage, are Booneville Reservoir on the South Fork, and Red River Reservoir on the fourth major tributary of the Kentucky River.

Louisville District proposed 10 additional flood control and regulatory reservoirs for consideration in the initial studies. These, plus those named above, would bring a troublesome river under rather complete control, and open up all flood plains below the dams for needed development. However, in view of the limitations of time and capabilities, the screening process deferred the others and selected just Ulvah (Kingdom Come) Reservoir primarily for reducing the serious flooding at Hazard (a defined growth center), and on the Fork with the least flood control. Continuing studies, a public hearing, and numerous conferences with local officials on the North Fork Kentucky River above Hazard have led to a conclusion that the permissible alternative means for significant federal participation in reduction of flooding damages should be extended to encompass redesign of the city to accommodate flooding without serious losses.

13. WATER SUB-REGION I

Sub-region I is drained primarily by the Cumberland, and partially by the Green Rivers. Mainstem development on the Cumberland and its major tributaries is quite extensive, and no recent basin plans have been developed. The upper reaches of the Cumberland River have quite similar water and economic problems as those of the Upper Kentucky and Big Sandy Rivers.

A developmental strategy emphasizing development of hydroelectric power and navigation was advanced by the Nashville District. The studies involved were for adding a lock to the authorized Celina Dam, and a cargo lift over the existing Wolf Creek Dam; and multiple-purpose developments, with hydroelectric power, for projects on Parker Branch, Rockcastle River at the Narrows, and Big South Fork (Devils Jumps). Proposed projects emphasizing flood control included the authorized Martin's Fork Reservoir above Harlan, Kentucky, and a local protection for Jellico, Tennessee (in Sub-region J).

Additional studies were conducted subsequent to the screening studies on the Celina Lock and Dam - Wolf Creek Cargo Lift, and Rockcastle Narrows - Parker Branch, and Big South Fork Reservoirs. During these studies, the State of Kentucky acted to reserve the lower section of the Rockcastle River for possible inclusion in the forthcoming wild and scenic river legislation, precluding further studies of the Rockcastle Narrows project. Further studies indicated that the tandem Parker Branch project, now alone, would not be justified, nor meet the comparability test for power; thus the project could only be advanced for recreation purposes, with possible inclusion of power at a later date. Expansion benefits from recreation development did not appear adequate to provide a basis for recommendation at this time.

Analysis proceeded on the Celina Lock and Dam - Wolf Creek Cargo Lift tandem navigation projects until it became apparent that, partly because of the pending impact of the Appalachian Development Highway System, an entirely new traffic survey would be required to update the navigation analysis. The study could

not be completed in time for meeting the schedule for the Appalachian Water Resources Survey, and was then deferred.

Project studies on the Big South Fork (Devils Jumps) Reservoir were conducted through the public hearing stage, when, as directed by the Flood Control Act of 1968, an interagency study of alternatives was initiated in response to opposition by conservation and preservation groups. Thus the plan of development for Sub-region I contains no recommendation for new project proposals.

14. WATER SUB-REGION J

Sub-region J is drained primarily by the Tennessee River and reported by the Tennessee Valley Authority. TVA projects, having been approved by the TVA Board, are eligible for funding in the President's budget message to Congress. A comprehensive interagency framework study of the entire Tennessee Basin has been planned and is awaiting funding.

The main stem of the Tennessee has been rather fully developed over the past three decades, and the focus of water resource planning has shifted to tributary development programs. As part of its ongoing programs, TVA considers the potential economic impact of water and related lands development in the various tributary areas. One of the tributary areas in Sub-region J where such a development program would have major effect, both in supplying existing needs and enhancing developmental opportunities, is the French Broad River area of North Carolina. The Asheville-Hendersonville growth corridor would be substantially enhanced by the flood control, water quality and water supply provisions of the Upper French Broad River Project which is planned by TVA and presented in this report. Also identified are other tributary areas where continuing or future investigations are warranted.

The Jellico, Tennessee, Local Protection Project was studied by the Nashville District and further work suspended, until the effects of the Tennessee State project for strip mine reclamation can be determined; additional protection from flooding appears to be clearly uneconomic at the present time.

15. PRINCIPAL CONTRIBUTIONS BY SOIL CONSERVATION SERVICE

Early in 1965 it became clear that the upstream watershed conservation and development program (PL 83-566, as amended) in Appalachia was lagging similar programs elsewhere in the nation. Study showed the causes included the region's economic underdevelopment which, along with quite low per capita incomes, made it nearly impossible for local sponsors in the conservation districts to obtain the funds necessary for the required cost sharing, even to initiate the planning process.

It was then decided that the best way to vitalize the watershed program would be for the U.S. Department of Agriculture (USDA) to make a number of preliminary investigations on their own. The Soil Conservation Service (SCS) delineated 100 selected new watershed areas thought likely to possess attributes conducive to furthering economic development.

The 100 watershed areas were screened and selected by the SCS and other USDA and state and local conservation agencies and districts. None of the 100 watersheds proposed at this initial period for extensive, although preliminary, investigation offered goods and services clearly duplicating those which would be rendered by the larger, Corps or TVA, projects. Nearly all met all three of the following criteria: (1) benefits stemming from the proposals flowed to both urban and rural areas; (2) estimates of benefits, including developmental benefits, exceeded costs; and (3) the urban areas benefited were associated with cities and towns that would probably be designated as growth centers. Because the results of such studies did not directly influence the choice of major project alternatives, SCS proposals are not further discussed in this Chapter. Yet, they are integral with the sub-regional plans presented in Part II and summarized in the following Chapter.

SECTION II - INFLUENCES THAT SHAPED THE PLAN

16. COORDINATION DURING THE SURVEY

Planning is the process of bringing together the viewpoints of all appropriate individuals and agencies concerning what ought to be done and how to do it, balancing and coordinating until feasible and desirable courses of action emerge, and then describing and presenting these actions in the form of attainable projects or other administrative efforts to those who must make the decisions both as to policy and expenditures. In this Section is discussed the background of viewpoints that operated to condition and shape the analyses of projects discussed in the preceding Section.

An active partnership among State and Federal agencies and interests has been sought in the formulation of the Plan of Development of Water Resources in Appalachia. The plans of private interests were also considered to the extent they were available. The viewpoints of local officials and many private citizens were solicited.

Definition

Coordination was defined in the *Plan of Survey*, adopted in February 1966, as follows:

"Coordination involves the deliberate review of the working papers, plans and recommendations of one office or agency and their detailed comparison with the working papers, plans and programs of another office or agency with the view to integrating the plans harmoniously for maximum benefits. The end result of good coordination is the integration of the plans of all interests (federal, state, local, public and private) into a composite and interrelated program having, for example, resolved all competition for different uses of a single tract of land, or other resource."

Coordination has been effected at all points during the studies that led to development of the plan. The principal mechanism for coordination and guiding plan development was the Water Development Coordinating Committee for Appalachia (WDCCA) [1].

Through the WDCCA

Although all sessions of the WDCCA were important to the survey and the coordination of each step along the way, two meetings particularly stand out in shaping the plan. A summary of the first stage studies conducted by the Corps of Engineers Districts, TVA, and State Soil Conservation Service offices participating in the Appalachian Water Resources Survey was presented at the fourth WDCCA meeting held in Cincinnati, Ohio, 26-27 October 1966. Over one hundred CE and TVA potential projects were considered and recommendations for continuing studies were made. The Office of Appalachian Studies subsequently held meetings with the state members of the WDCCA and the appropriate Corps of Engineer Districts or TVA, and with the USDA survey representative, to determine those projects for which detailed studies leading to authorization could be made within the time schedule and funds limitations imposed by the Survey.

The results of screening studies were presented to the WDCCA at the fifth meeting in Atlanta, Ga., 15-16 February 1967. Priorities assigned to plan elements represented a trade-off between all affected interests. Preferences shown by the States reflect both an overall developmental strategy and an evaluation of the validity of the value systems of various local interest groups. Corps of Engineers Districts, TVA, SCS and other federal agencies choices reflect both their program interests, the attitude of their constituencies, and the status of their going programs.

The State Supplements

Each of the Appalachian States wrote supplements to the report (Part V, Volumes 13

and 14) which provided an overview of their going plans and programs in water and related resources management and development. These were used extensively during the drafting of the sub-regional plans, presented in Part II.

With the Commission

Coordination with the staff of the Appalachian Regional Commission (ARC) existed on a different plane than with the Districts and state water agencies. The influence exerted by ARC on individual project proposals was more limited than their effect on plan development as a whole. During the initial studies and project screening, ARC representation on the WDCCA, and budget allocations, affected the research program undertaken. Numerous studies bearing on plan development were jointly funded by the ARC and the Corps of Engineers, and the research program was designed to complement both ARC's program and the requirements of the survey. ARC's staff work affected the delineation of growth centers and thus influenced the location of plan elements. Also, ARC's staff reviews of the preliminary project and sub-regional reports offered additional and important opportunities for coordination. ARC's interest in other federal agency reports utilized in preparation of this report was largely limited to review.

With the Federal Departments and Agencies

Where agencies provided direct inputs into the planning process, as well as participating in review, close working relationships evolved between the agency and the APS staff. As is typical in comprehensive river basin planning, various Department of Interior agencies contributed direct reports on specialized areas of water and land resources development. The Geological Survey reported on ground water resources, costs, and quality across the region. The Fish and Wildlife Service prepared a report on fish and wildlife resources in the Appalachian region, and specific reports on Corps of Engineers projects under the Fish and Wildlife Coordination Act of 1958. The Bureau of Outdoor Recreation prepared a report on the recreation resources of Appalachia and an estimate of needs for continuing development to

meet the demand for additional recreation opportunities, along with separate project analyses on Corps of Engineers project proposals. The National Park Service studied the archeological, historical and natural science values at most of the projects described in Part III. The Federal Water Pollution Control Administration (FWPCA), assisted by special studies made by the Public Health Service, Department of Health, Education and Welfare, prepared a report on the quantity and quality of surface water in Appalachia, and made recommendations for water quality management, along with individual reports on Corps of Engineers projects. A special report on the abatement of acid mine drainage was prepared jointly by ARC, APS, FWPCA and the Bureau of Mines.

The Federal Power Commission evaluated the power resources of the Appalachian Region and projected power needs. The Southeastern Power Administration, Department of Interior, also cooperated in the study. The Office of Business Economics, Department of Commerce, developed an economic base study for the Appalachian Region, while the Business and Defense Services Administration, Department of Commerce, prepared an analysis of water use by Appalachian manufacturers in 1964. A report on the soil, timber and water resources of Appalachia from the standpoint of agricultural and conservation interests was prepared by the U.S. Department of Agriculture. Modifications of the going programs administered by various agencies within the USDA were proposed. The Department of Transportation did not prepare a special report, but was represented on the WDCCA.

In the conduct of studies on how to meet the increasing recreation needs posited in 1980, the Forest Service was requested to up-date and present their plans for accelerating recreation facilities development in the fifteen National Forests in Appalachia. These plans capitalize on the new developmental corridors and other improved access to the Region, and are presented as Supplement B to Appendix F.

Of Water Quality Considerations

During the early years of this survey effort, standards for the water quality of the

interstate streams of Appalachia had not been established by the states, nor approved by the Secretary of Interior. As a result, and in order that the planning not be delayed, certain assumptions were made. These had the effect of avoiding a form of coordination that could not have been accomplished, in any case, since data and plans were not available.

The assumptions were that, on those reaches of any stream in Appalachia where the benchmark projections of effluent loads from municipalities and industries (measured in population equivalents) were such as to so require, a minimum of at least secondary treatment, or 85 percent removal of biological oxygen demand (BOD), would be assumed installed before consideration would be given to releases from storage to supplement the natural stream reaeration and recovery capacities. Therefore, in the plan submitted herein, water quality storage has been incorporated in reservoirs only for those cases where secondary sewage treatment will clearly not be able to prevent unacceptable degradation of stream quality.

Of Economic Measurement Methods

In addition to agency coordination of the types discussed above, special mention should be made of the efforts to bring about comparable handling of economic considerations throughout the plan. The treatment of economic development as an explicit purpose in the Appalachian Water Plan made it desirable to go further than usual in seeking agreement on economic measurements.

Early in the planning process, economists representing the principal agencies exchanged information, making it possible to disaggregate the OBE projections to water sub-regions and to state planning sub-regions. As the planning progressed, a series of workshops and conferences was held to discuss ways of measuring the economic development impact of water resource and related development efforts. The analysis found in the Royalton Reservoir project on the Upper Licking River (Supplement to Volume 6), as well as the economic studies elsewhere in the plan, stem from those group efforts.

17. EFFECTS OF OBJECTIVES ON PROJECT PROPOSALS

The three objectives for this Survey -- regional economic development, national income gains, and environmental improvements (See page I-1-1) -- and the relative weights assigned to each, clearly conditioned the projects selected and their scope. The first, economic development, not only was primary during the screening process, but also influenced project scale.

The Benefits and Accounts

As is explained in Chapters 1 and 9 of Part IV, Concepts and Methods, and demonstrated in the project analyses in Part III, several significant changes in methodology of estimating economic effects and allocating costs evolved during the Survey. Benefits are grouped in two broad categories, those which flow to users of project goods and services, and those that measure the economic expansion induced or stemming from the project. Both user and expansion benefits can fall into the national income and regional income accounts. These matters are also more fully detailed in Chapter 7 of this volume.

Expansion benefits are the principal measure of regional income gains; they are, therefore, important to project formulation. The degree to which they lead to changes in the character and scale of projects is dependent upon the economic setting in which the project is to operate. Water projects are built to provide a well known set of goods and services. In those instances where projects are to be built in underdeveloped areas, or areas in a state of transition from one production pattern to another, there are usually not enough users, hence user benefits, to justify a needed project. Thus, studies of the potential expansion effects, through study of the benchmarks and by micro-analysis of the setting, become essential guides to, and limits on, the character and scale of the project required to serve the developed or altered economic community. Projects so scoped can attain the dual objectives of accelerated regional development and increased national income.

In general, user benefits tend to control, and additional expansion benefits tend to be nil, when projects are built in a fully employed economy where no externalities exist. In such cases, the use of expansion benefits in formulation would not support changes in the character and scale of a project. The user benefits in such cases should exceed costs. When they do not, the project may be of doubtful worth.

Cost Allocation to Economic Development

Again, as explained in Chapter 7 and in Part IV, cost allocations in the project analyses have been made to the usual project purposes, and to economic development, using the Separable Costs - Remaining Benefits method. The use of regional economic development as a project purpose has the effect of reducing the costs of some purposes that non-Federal interests will have to repay. The fact that water supply is among the purposes for which reimbursement is reduced provides additional water supply for future growth to many Appalachian growth centers, where potential for such growth can be described. Irrigation and hydro-electric power also fall in this category. Another important effect of adding regional income augmentation as a project purpose is that the impact of program limitations suggested by the Federal Water Projects Recreation Act (PL 89-72) is altered in favor of recreation assuming a somewhat greater importance within the balance of project purposes.

The Several Forms that Projects May Take

The above considerations are clearly reflected in the diverse nature of the projects presented in Part III of this report. They demonstrate sensitivity, in various degrees, to the three objectives, and may be grouped accordingly.

One group, the largest, corresponds closely to the types of projects which would be developed under the classical objectives of water resource development. These projects meet needs of a dynamic and growing economy; the primary parameters of formulation can be designated by the market costs of the project

compared to the value of output. Examples in Part III are the Dalton and Hipes Reservoirs, and the Tamaqua LPP.

A second group includes the kinds of projects which are deliberately intended to start, rather than nourish, a developmental process. They may be thought of as "*developmental projects*." The significant benefit measurements are the expansion effects, which dominate the parameters of the formulation, evaluation and justification process. The best examples are the Salyersville LPP-Royalton Reservoir, and Midland LPP projects.

A third group includes those projects which possess features of both of the preceding groups, and which form a middle ground. For these, a tradeoff between classical and developmental objectives is necessary. Examples include the Royal Glen and Whiteoak Reservoirs.

Finally, all of the projects support the environmental objective to various degrees. Two reservoir projects contain elements with special environmental impact: St. Petersburg Reservoir includes special measures to abate acid mine drainage and visual pollution from mining, to enhance water quality and recreation, and to make the reservoir environmentally compatible with the potential national recreation river; and Logan Reservoir includes a nature area along Clear Creek to preserve, in public ownership, the unique ecological values found there. But only one project, Pennsylvania's Naturealm, is scoped with environmental enhancement as the primary objective.

18. CONSTRAINTS AFFECTING THE PLAN

On the Contents of Federal Water Plans

Federal water resource planning does not normally attempt to solve all of the identified water management problems that are known to the participants in a coordinated survey. Public works in which there is, by law, no federal interest are not normally presented in a report to the President and the Congress, nor are federal funds expended in performing the necessary economic and preliminary design studies. Information on structures which will affect water management plans, but which are to be built

with private funds -- except for power projects licensed by the Federal Power Commission -- is seldom available during basin planning. However, during preparation of a plan examining water resources investments and management to encourage regional economic development, reasons for setting aside some of these traditions became evident.

Thus, this report presents the Otocsin Reservoir, a nearly single purpose recreation lake, designed by Pennsylvania and to be built by her resources. This is done to give an example to others in Appalachia of a commendable activity, and to suggest support for this project, and others of similar scope, to those who appropriate for and administer applicable federal grant-in-aid programs. Thus, also, the two lake restoration projects in Sub-region A, which could not qualify as coming under the federal water program, were not developed to survey scope in this report.

Yet there are many other activities in and affecting water resources development which are performed by states, cities, state chartered districts and authorities of various forms and purposes, franchised privately owned utilities, and private interests which are not adequately pondered in basin planning conducted under federal auspices.

There are many basic reasons for this. First, our federal system delegates certain functions to the states who, in turn and fairly uniformly, have delegated most of the functions concerning land use controls, and zoning and renewal of privately owned real property, to the cities and counties. Second, in the East where the riparian doctrine of water law generally holds, water is a common good, not subject to the tight controls exercised by the Western water rights states. Lastly, planning horizons, and the associated required degrees of detail, differ widely; industry seldom plans beyond 10 years, and cities consider a 20-year plan fairly long range; whereas, because federal water projects have economic and physical lives of 50 to 100 years, extended planning horizons are normal.

Two results of these considerations were discussed in Chapter 4. Electric energy requirements in Appalachia, from 1960 to 2020, will multiply 25 times, yet the serious

implications of these projections on the water resources base are not dealt with herein. Similarly, estimates of the full recreation potential of the Region, and the water investment policy implications to be derived therefrom, have not been attempted. Even had the resources been available to make these two studies, the existing constraints on long range planning that involves detailed land use controls would have prevented them. Property laws prevent government from requiring that a private owner sell his lands for indefinite future uses to a power utility, although government may accept or reject an application to erect a steam electric plant at a specific location, once the utility has negotiated an option from the owner. Because the utilities cannot now be required to prepare 50-year plans and assemble the lands they will need in the Twenty-first Century, there is just no practical way, at this time, to resolve the issues raised. Similarly, delineation of the full water-oriented recreation potential of Appalachia, for even a short-range plan, depends on the freely arrived at discussions by many voters, after appropriate discussion and debate, a lengthy process; and many hold the view that the right of eminent domain should not be applied to taking lands solely for parks and other recreation purposes.

Several other important aspects of water management have not been dealt with in this Plan, for basically similar reasons, and are detailed below. In each case either a law, a policy or the absence of one, or an inter-governmental procedure, or all three, act to constrain the scope of the plan.

On Federal Participation in Recreation Lakes

The Federal Water Project Recreation Act (PL 89-72) limits Federal participation in the construction of reservoirs having recreation as a purpose to not more than 50 percent of the separable costs, plus the joint costs. This has the effect of inhibiting the contributions that federal water construction agencies have made to the states and local agencies in the preparation of master plans for water-oriented recreation. Federal reservoirs are sited for other reasons than meeting recreation needs, and master plans must be prepared around these fairly fixed locations.

This means that the federal lakes are often at a considerable distance from the cities, and are usually prohibitively far for those with the greatest need for outdoor renewal -- the poor who lack a reliable family automobile.

This Survey has thus been constrained and, for instance, has not offered resolution of the urgent water-oriented needs for recreation in Sub-region F, and particularly in the Pittsburgh SMSA. For the poor in this generation the only foreseeable alternative is the public swimming pool, when available.

On Flood Damage Prevention through Urban Redesign

The plan presented in Chapter 6 includes the Tamaqua, Pennsylvania local protection project, where the relocation of Wabash Creek through a tunnel will permit the city to institute an urban renewal project in the area then protected, and thereby increase job potential. Here an economically feasible flood control project can be installed somewhat independently of the later urban redesign, although in the context of the objectives of the plan, the urban renewal is essential.

Yet in other cases, application of the full list of available structural measures, as institutionally defined by the water construction agencies, falls far short of economically reducing flood damages, and of protecting struggling urban centers. Typical examples are found in certain portions of Central Appalachia where the combination of difficult terrain, poor land use and poor structural design (in respect to flooding hazard) results in serious and persisting urban damages. Reservoir control in such cases normally entails extensive and expensive relocation of transportation routes, may preclude mining activity in the reservoir area, and often causes traumatic relocation of upstream communities and families. Such terrain normally limits the use of levees and, in addition, rapid stream rises may inhibit the on-time installation of closures associated with levees and flood walls. Channel clearing and stabilization generally are effective only against smaller floods, leaving the populace subject to relatively high risks in larger floods. In such cases, effective results can come only from a combination of flood protection and

flood-proofing, coupled with wise land use regulations, possibly involving a structural renewal program. Such solutions fall outside the traditionally supported flood control approaches and, therefore, receive less attention and study than they deserve. They also involve broadening the institutional base.

Heartening trends of inter-governmental cooperation and coordination are beginning to appear. The flood control - renewal project in Oliver Springs, Tennessee is an excellent example. Recently the Department of Housing and Urban Development has joined with the Corps of Engineers in a project in Waterloo, Iowa. Such joint approaches are difficult, since they involve cooperative agreements at many echelons and simultaneous funding, where the funds are administered in several channels. At this time, such agreements are more fortuitous than deliberate.

On Non-structural Solutions

The Plan incorporates a number of non-structural measures that will improve the performance of the water resources base in Appalachia in meeting future needs, to the extent that they are practical alternatives to the traditional approach offered. Unfortunately, some non-structural alternatives are technically feasible but, under present water resource programs, lack institutional support or controls. Flood plain management programs based on accurate flood plain information are advocated in all areas of Appalachia to reduce the growing rate of flooding damages.

Planning and application of conservation land treatment practices on all open land, improved management of forests, and reclamation measures for mined lands can reduce flooding, improve water quality and augment low flows by reduction of sediment production and improvement of the retention of rainfall. Current controls on sediment producing general and highway construction are not adequate.

Because water is relatively abundant and inexpensive, major reductions in water use by municipalities are not anticipated. However, reduction in water use per unit in industrial output is anticipated, and reflected in projected

industrial water use rates. These improvements are anticipated to be primarily the result of new technology which is aimed at reducing effluent discharge to receiving streams, by increasing the use of recycling and closed loop systems, resulting in lower water intake.

Non-structural alternatives for increasing the efficiency of use of recreation facilities include encouragement of more uniform use through the week, and relatively lower use in weekends. Increased leisure time should augment this trend.

The urgent need for training waste treatment plant operators was described by FWPCA in Appendix D. Since completion of this Appendix, Department of Labor funds have been both allotted directly to the states, and contracted to FWPCA for such training. During the fall of 1969 training of approximately 270 operators has been initiated at training centers in nine of the thirteen Appalachian states.

On Considering Water Distribution

Federal agencies do not design or build municipal water supply and distribution systems, although there are several grant-in-aid programs to assist non-federal interests in constructing urban and rural systems. When water supply storage is incorporated in a federal reservoir the full costs therefore must be reimbursed. These facts have constrained the completeness of the plan in several respects.

Although other examples could be cited, the water distribution system in Appalachian South Carolina is a classic case. Rapid growth is occurring along Interstate 85, which crosses the Savannah just below Duke Power Company's Keowee-Toxaway project, runs northeast across the headwaters of the Upper Saluda and a number of smaller streams, and leaves the state below the proposed Clinchfield Reservoir. Although water supply impoundments in the headwaters can help for a while, the projected growth in the whole area will clearly require intercity distribution systems, tapping one or the other, or both, of the two major reservoirs at the ends of the growth complex. This situation poses knotty questions to four large cities, six counties, numerous small cities and communities, a private utility and the federal government. What is the

least costly set of time-phased alternatives that will supply the necessary municipal and industrial water, and will control water quality, so that growth is not impeded?

The institutional mechanisms, and policy decisions concerning responsibilities, are not yet available to attempt solution of this problem. It is hoped that the report of the current North-East Water Supply (NEWS) survey by the North Atlantic Division of the Corps, including actions taken during administrative and legislative review, will provide the needed basic guidance.

On Incorporating Pumped Storage

There is an absence of policy concerning whether federal agencies should study, design and propose construction of isolated (single purpose) pumped power installations. As a result, no such studies are in this plan, although TVA is considering such an installation on Raccoon Mountain, near Chattanooga.

Pumped power has much promise in meeting peak demands, but such installations also place considerable demands on the water resource base. To avoid vast and rapid fluctuations of water levels, forebays must be either on large reservoirs or on estuaries. For example, one proposal considered during this survey was to dam the undeveloped lower reaches of Middle Island Creek, West Virginia, using the Ohio mainstem as an afterbay. The scheme was dropped for the lack of policy, and when it was found that the 35-mile pool above Willow Island Locks and Dam would fluctuate 6 feet, also eradicating a muskellunge fishery.

On Low Flow Augmentation from Upstream Watersheds

In conducting its investigations of upstream watersheds, Soil Conservation Service has identified several (one of which is shown in Tables 7-2 and 7-5, Pages 1-7-7 and 11), where it is physically feasible to store additional water to augment low flows, and where water quality benefits could be considerable. However, PL 83-566, as amended, does not specifically authorize federal participation in the costs of providing water quality storage, and this must be reported as a possible constraint on the plan.

Whether and how water quality could be added as a purpose in upstream watersheds, with federal participation, is a matter requiring much further study. The first problem concerns whether a finding of widespread benefits under PL 87-88 could be made, with a resultant Federal interest residual in the structures. This leads to other problems concerning physical design for low flow releases; monitoring, regulation and control institutions; and increased costs for lands, construction, and operations and maintenance, which local interests may be unwilling to absorb.

19. FORMULATION SUMMARY

The planning process undertaken in this survey, with its heavy emphasis on regional development, has led to a consensus about the needs for water resource development, and to a display of the various roles which public water resources programs can play in stimulating regional development. This chapter has emphasized the relation of current water resources development, particularly by the Corps of Engineers, U.S. Department of Agriculture and TVA, and the coordination process, on the definite project proposals advanced in this report. The intent is not to denigrate recommendations for future studies and programs, which may form a much more strategic role in the future development of Appalachia than current programs and the new projects proposed, but to emphasize the range of explicit alternatives considered, and to relate the nature of tradeoffs represented in the recommendations of this report.

Reference:

- [1] Membership was from Army (Chairman), Agriculture, Commerce, Interior, Federal Power Commission, Health, Education and Welfare, Transportation and Tennessee Valley Authority; from the Appalachian Regional Commission staff; and from the 13 Appalachian States.

CHAPTER 6 - PLAN OF DEVELOPMENT

1. INTRODUCTION

The Appalachian Water Resources Plan is designed to serve Appalachian growth centers by providing a wide range of water and related services. The plan utilizes many different means to attain its primary objective - assisting regional economic development. While emphasis has been placed on the needs of growth centers, all of Appalachia (as well as many areas beyond its boundaries) will be served under the plan.

The plan specifically includes recognition of the following project purposes: flood control, water supply, soil and forest conservation and development, pollution abatement, fish and wildlife enhancement, general recreation, power, navigation, irrigation, and economic development. These purposes have been carefully reviewed in light of identified needs, the status of current water resource development programs and the alternatives for meeting present and future demands. Estimates of regional potential and change, in terms of population, employment and income, to 1980 and 2020, were utilized throughout plan development.

The plan includes recognition of three levels of project planning elements: (1) the existing facilities and programs, and those in advanced planning and underway are an integral part of the plan, as they are capable of supplying a large part of water and related resources for present and some future needs; (2) the recommended new projects and programs, including modification of existing works; and (3) the research and studies needed to guide future plans where there is not a clear solution to known problems and where future problems are not fully identified. These elements are incorporated, by major agency, in the recommended plans presented below.

2. METHOD OF PRESENTING THE PLAN

The Appalachian Water Resources Plan is presented here in state summaries, preceded by a summary of the plan for the region as a whole. Part II of this report contains a detailed statement of the plan by water sub-region. Part

III contains detailed project reports for fifteen Corps of Engineers and two Tennessee Valley Authority projects, and two selected state projects, most of which are proposed for early action. The plan rationale, presented by states, is not as detailed as that developed in Part II for each water sub-region, but the importance of the states in carrying out all phases of the Appalachian Regional Development Act of 1965 makes it desirable that each state's part in the plan be readily identified, and widely understood. The Map Folio, Volume 2, also presents the plan by states, containing thirteen basic maps and an overlay showing essential plan elements. Additional detail on plan elements by states is found in Part V, the State Supplements.

3. THE PLAN FOR APPALACHIA

Water resource developments are not new in the Appalachian region or in any of its states. The federal investment in public water resource facilities now serving Appalachia is about \$2.25 billion (at time of construction). There are in addition about \$2.35 billion of federal water development facilities underway or in advanced planning, which are, for the purposes of estimating needs to be met by this plan, expected to be in operation by 1980. These investments are the foundation on which this regional water plan is built. The value of the large state, city, and private investments in water facilities in Appalachia is, of course, closely related to the effectiveness of the federal systems and programs, but no estimate of the non-federal investment is available.

The installed facilities in Appalachia are, for the most part, effectively utilized, but many of the private and some of the public systems are reaching utilization capacity. The regional growth potential (shown by developmental benchmarks for population and employment, by states, in Table 6-1) cannot be achieved without a new active water resources development plan in which each state has an important part. The percentage of the year 2020 needs met by structural measures in the early action plan is summarized for the region as follows:

TABLE 6-1
DEVELOPMENTAL BENCHMARK POTENTIALS, POPULATION, AND EMPLOYMENT OF APPALACHIA BY STATE
(APPALACHIAN PORTION)

State	Appalachian Area of Sq. Mi.	Percent of Area in Appalachia	% of State Population in Appalachia (1960)	Actual		Developmental Benchmark Potentials			
				1960		1980		2000	
				Pop.	Emp.	Pop.	Emp.	Pop.	Emp.
Alabama	24,687	48.54	60.8	1,982,286	657,478	2,771,000	992,000	4,038,000	1,568,000
Georgia	10,813	18.57	17.1	675,024	240,814	959,000	381,000	1,334,000	502,000
Kentucky	16,982	42.61	30.4	922,152	224,519	981,000	278,000	1,270,000	469,000
Maryland	1,546	15.63	6.3	195,808	66,509	226,000	95,000	300,000	118,000
Mississippi	10,313	21.77	18.6	406,187	134,040	597,000	203,000	852,000	300,000
New York State	11,843	24.75	5.9	1,000,064	371,554	1,284,000	495,000	2,042,000	777,000
North Carolina	11,921	24.29	20.6	939,740	338,347	1,274,000	526,000	2,000,000	777,000
Ohio	13,751	33.52	11.5	1,119,540	354,051	1,418,000	446,000	1,878,000	704,000
Pennsylvania	36,689	81.48	52.4	5,930,812	2,020,980	7,136,000	2,498,000	9,587,000	3,486,000
South Carolina	3,964	13.09	24.6	586,521	233,356	872,000	343,000	1,426,000	555,000
Tennessee	19,242	46.51	45.1	1,607,690	539,904	2,240,000	799,000	3,180,000	1,240,000
Virginia	9,387	23.56	12.6	500,317	146,170	690,000	220,000	871,000	328,000
West Virginia	24,085	100.00	100.0	1,860,421	538,862	2,126,000	688,000	2,657,000	1,027,000
Appalachia	195,223			17,726,562	5,864,584	22,574,000	7,964,000	31,435,000	11,851,000
								43,390,000	16,532,000

<u>Water & Related Land Development Needs</u>	<u>Needs Met By Selected Plan</u>	<u>Percent of Estimated 2020 Needs</u>
Annual Flooding Damages (\$1,000)	\$ 21,728	12
Water Quality (Acre-feet)	443,000	11
Water Supply (mgd)*	731*	3
Annual Recreation Days (1,000)	26,400**	—**
Land Treatment Needs (1,000's acres)	16,500	18

* Does not include municipal and industrial water supply from 69,000 acre-feet in 20 upstream watersheds included in early action plan.

** Does not include annual recreation days at the National Forests. The selected plan meets only a small fraction of projected 2020 needs for public recreation.

The plan thus does not provide for all the needs that will develop by 2020. Consequently, future studies are essential parts of the plan. These studies are designed to determine the best solutions to meet unfulfilled needs.

Care must be taken not to overemphasize the new projects (or expansion of established works) planned for early installation. These proposals are supported by extensive cost and benefit data which, unfortunately, tend to highlight these aspects of the plan, obscuring those elements not so fully quantified, as for example, those parts recommending future studies which are not at this time quantifiable in

terms of cost or ultimate benefit. It must be recognized that the projects recommended for early action were, in part, selected on the basis of available data of the type and quality essential to support requests for authorization and funding. Accordingly, this early action phase should not be looked on as containing all of the investments which might ideally have been presented for early action.

The benefits and costs (Federal and non-Federal) of the structural investments proposed in the early action plan, being the projects and upstream watersheds in Tables 7-1 through 7-5, are summarized below by purposes:

<u>Purpose</u>	<u>Benefits (\$000)</u> (Annual Equivalent)	<u>Allocated Costs (\$000)</u>	
		(Annual Equivalent)	(Construction Costs)
<u>User</u>			
Flood Control	11,279	9,787	220,684
Water Supply	3,539	1,680	31,734
Irrigation	50	21	410
Water Quality	6,281	3,642	72,135
Recreation, including Fish & Wildlife	25,231	16,157	263,239
Power	8,440	6,178	66,548
Navigation	9,664	10,310*	210,593
Other	1,836	407	9,299
Total user benefits	66,320		

<u>Purpose</u>	<u>Benefits (\$000)</u> (Annual Equivalent)	<u>Allocated Costs (\$000)</u> (Annual Equivalent) (Construction Costs)	
<u>Expansion</u>			
Regional Income Augmentation	578,413	<u>13,234**</u>	<u>251,379**</u>
Total Costs		61,416	1,126,021

* Navigation projects have additional benefits, but costs have not been allocated thereto.

** Does not include associated costs required for economic expansion; for these see Table 8-2, page I-8-5.

Plan Purposes

The principal purposes of the regional plan are discussed briefly below. No significance should be attached to the order in which purposes are discussed; however, the reader will find in Table 11-1 (Starting on page I-11-2) the broad priorities of the plan by purposes in each state.

Flood Control and Prevention

Throughout the history of Appalachian development, floods have seriously threatened life and economic well being. All of the major river systems draining the region have severe and widespread flood damage potential, and many of the minor streams produce dangerous and damaging local flooding. Since the passage by Congress of the 1936 Flood Control Act, 70* mainstem flood control reservoirs have been built and 36** upstream watershed projects (including 134** flood retardation impoundments) have been completed in Appalachia. In the plan of development proposed herein there are now under construction or authorized 36* mainstem reservoirs and 139** upstream watershed projects, containing 1,156** structures with flood retardation as a purpose. In addition there are some 146* federally sponsored local flood protection projects in operation in the region, and 35* under construction or authorized. The combined federally sponsored

flood control works expected to be operative by 1980 represents a public investment of about \$2.55 billion, of which \$2.30 billion is federal and \$0.25 billion non-Federal. By 1980, there will be in Appalachia an installed flood control capacity of about 17 million acre-feet. All of the major streams of Appalachia have received some flood control investments.

Notwithstanding the formidable provisions made to control floods, there are still major damages in many basins from periodic stream overflow. The early action plan for reducing flood damages contains 13 mainstem multiple purpose projects and 42 upstream watershed projects.

All of the mainstem flood control projects and many of the upstream watershed projects are multi-purpose, serving such additional purposes as water supply, water quality control, fish and wildlife enhancement, recreation and, in one instance, power. All of the multi-purpose projects have economic development benefits as well, and some of the upstream watershed projects also will produce such benefits. Where there is no feasible structural solution to the flood problem, reduction in damages must come through community planning which will direct new growth away from the flood plain, or provide

* As of September 1969

** As of 30 June 1967

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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)

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guides to flood proofing where the flood plain must be utilized. Recognizing the continuing nature of the flood control problem, the water resource plan recommends that 171 flood plain information studies be carried out as rapidly as funds permit, and that flood plain insurance studies be made as authorized.

Water Supply

About 7,700 million gallons of water per day are used by municipalities and industry in Appalachia today (1969). This estimate does not include water used in agriculture, mining and thermal power production. Using the developmental benchmarks as guides to economic growth, the 1980 water supply need for municipalities and industry will be about 13,300 mgd, increasing to 23,400 mgd by 2000, and 42,200 mgd by 2020.

While Appalachia, considered as a whole, has a generous natural supply of water suitable for municipal and industrial use, there are a substantial number of cities and industries operating near the margin of available water supply, both surface and subsurface. By the year 2020, there will be substantial needs that cannot be met by the facilities planned to 1980.

The water supply projects in the early action phase of the Appalachian plan will supply 731 mgd for municipal and industrial use. Nine multiple purpose mainstem projects contain water supply features. Upstream watershed projects in the early action plan will also supply municipal water supply from about 69,000 AF included in 20 projects.

Meeting some of the water supply needs for 2020 and beyond may, in some cases, require stream diversions of considerable magnitude. The plan provides for making comprehensive studies where such requirements are anticipated.

Per capita water uses are projected to increase moderately over the planning period, but uses per unit of industrial output are expected to decline slightly, due to improved technology.

Upstream Watershed Investigations and Development

In addition to the 100 special preliminary upstream watershed investigations (See Chapter 5), made cooperatively by the U. S. Department of Agriculture and the state and local interests, a review was also made of the status and potentials of other going watershed planning in the Region. From these actions, USDA evolved lists of nearly 500 watersheds of apparent promise, which were screened in a manner similar to the project screening described in Chapter 5. This resulted in the listing in the July 1967 draft of Appendix A of the 198 upstream watersheds reported on favorably in that document. At that time, none of the 198 had been authorized for preparation of work plans, although a few have moved forward in the past two years; also, as shown in an addendum published with Appendix A, 44 watersheds have been added to the original list.

The 198 watersheds were reported to all the field agencies concerned with this survey. One may note that 94 of the 100 special studies made the list. During the preparation of the sub-regional plans, the 198 were further screened for urgency of need fulfillment in relation to the evolving plans of the states, growth centers, and water basins. From this, a list of 42 upstream watersheds was selected representing water resources investments fully compatible with all other developmental plans, and which supply urgently needed flood control, water supply and recreation to areas of considerable growth potential. These 42 are shown in the summaries of the plan, by states, in this Chapter, labeled "For Early Action", and work plans thereon should be jointly studied with the Corps of Engineers, the States and other agencies as rapidly as appropriations permit. The other, approximately 190, watersheds also are named in the summaries.

An important fact concerning the 42 is that 16 of them, each having been one of the 100 produced by the special studies, have great developmental promise but cannot be carried forward for planning under present procedures,

without Congressional sanction, because primary benefits do not equal or exceed project costs. Each would provide a high degree of flood protection to urban areas having growth potentials, where developable lands free from flood hazard are not available. Each, therefore, resembles the two major projects in this plan which were formulated on the Licking River, Kentucky, at Salyersville and Midland, where the benefits of the projects' services to users are less than costs, but where the expansion effects are marked and considerable. These 16 fall in the states of Ohio, Pennsylvania, and West Virginia, and are separately identified in their summaries of the plan presented below.

Each of the approximately 190 other watersheds named below also shows considerable promise of augmenting the developmental potential of the Region. In Appendix A, USDA recommends that their planning and installation should be accelerated, over and above the going program under PL 83-566, so that they all are in operation by 1990.

Soil and Forest Conservation and Development

The economic development of Appalachia requires continued programs for soil and forest conservation. The principal soil conservation problems are erosion and impaired drainage. The U.S. Department of Agriculture has found that there are about 9,268,800 acres of cropland both upland and in the flood plain, with the dominant problem of erosion; 2,351,600 acres with an excess water problem; and 511,300 acres with unfavorable soil conditions needing treatment. It is estimated that about 1 million acres of cropland should be converted to less intensive use due to limiting natural capabilities of the soil. The new uses would depend upon the character of the soil and the needs of the area, and would range from pasture through woodland to wildlife habitat.

The pasture land of Appalachia also needs improvement. USDA estimates that land treatment needs would include about 4,855,800 acres of new pasture planting; 5,133,900 acres of pasture needing improvement of vegetation cover;

and 2,887,600 acres needing protection from overgrazing and invasion of undesirable plants.

Forests of Appalachia need treatment and better management to contribute their full potential to the regional economy. About 64,760,500 acres of state and private forests and woodlands, and 1,769,300 acres of National Forests need land treatment measures. Increased fire protection, access roads, and better management are also needed.

Areas of Appalachia that are critically eroding need urgent attention. Left untreated, they not only deteriorate rapidly but damage adjacent areas. The erosion from strip mining is well known, but there are many other eroded areas. Sediment is greatly increased by active erosion and is a major water pollutant.

Critical area treatment for stabilization is needed on about 781,000 acres of surface mined areas and on 112,900 acres of roadbanks. The National Forests have 58,000 acres needing stabilization of erosion, and in state and private forest areas there are about 1,773,600 acres needing treatment. These estimates include eroded logging roads and trails.

In summary, of the 125,111,400 acres in the Appalachian Region, 92.2 million acres, or 74 percent, need conservation treatment.

The fifteen National Forests have a potential for much greater contribution to the development and economic growth of Appalachia than present programs permit. To achieve this, the Forest Service recommends a more intensive resources development program. This program includes: (1) the acquisition of over 2,650,000 acres of land within and adjacent to National Forests; (2) multiple use zoning and development of over 15,730 acres for recreation purposes, including 1,880 undeveloped sites for various recreational activities, and 53 major specialized recreational complexes (to further these uses 4,050 acres of recreational water impoundments are proposed); (3) construction in the National Forests of 6,600 miles of access roads and trails with bridges, observation sites and roadside developments; (4) substantial improvement of the

forest fire protection system necessitated by the increased use of the forests; (5) enlargement of the fish and wildlife programs to improve the habitat and to help reduce the impact of increased fishing and hunting pressure; and (6) greatly improved timber management practices. This requires an estimated 1,900 acres of water development, and 21,800 acres of stream and lake habitat improvements.

Water Quality Control

Each year Appalachian streams have become more polluted with waste from cities and industry. Currently, waste loadings, prior to treatment, are estimated to be the equivalent of the wastes from a population of 34,300,000 and, if the benchmark goals of economic development are achieved, wastes are expected to increase to 60,000,000 (population equivalent) by 1980, to 106,000,000 (PE) by 2000, and 176,000,000 (PE) by 2020. The Federal Water Pollution Control Administration has found that the greatest increase in water use and waste loadings, under study assumptions, would occur in the southern portion of Appalachia.

The control of pollution is expensive. The FWPCA estimates that \$275 million is needed by 1972 to provide secondary waste treatment facilities, but not including costs for interceptions and pump stations, for all presently sewered areas not now having secondary treatment, assuming a design population equal to 1990 estimates.

Water to maintain stream quality will be needed in a number of the river basins of Appalachia, even with an expanded program for pollution control through treatment of waste put into streams. For this report it has been assumed that at least secondary treatment of wastes will occur before waste requirements for dilution were estimated. In the program recommended for early action, water storage for quality control is provided by 11 multiple purpose projects, including over 378,000 acre-feet of water quality storage, which will provide annual benefits of about \$6.3 million. Construction costs allocated to water quality control are estimated to be \$82.6 million. One upstream watershed project for early action has tentatively included water quality control storage of 5,000 acre-feet

providing benefits of \$30,000 annually, requiring allocated construction costs of \$286,600.

Fish and Wildlife Enhancement

The plan for fish and wildlife enhancement covers both sport fishing and hunting, and commercial fishing operations. In 1964, about 3.2 million anglers fished 53 million days on 1,040,000 acres of reservoirs and lakes, 154,000 acres of ponds and 192,000 acres of fishable streams. Likewise, about 29 million man-days of hunting by 2.3 million hunters utilized 115 million acres of land in the Appalachian Region.

Commercial fishing is potentially important in Appalachia as there are 892,000 surface acres with commercial potential in the Region, capable of providing 43.8 million pounds of fish annually, but in 1966 only 4.9 million pounds of commercial finfish were harvested and 5.2 million pounds of shellfish. The value of the commercial fish crop was \$1,216,900 in 1966.

The demand for sport fishing is expected to increase 21 percent by 1980, 39 percent by 2000 and 61 percent by 2020 over the 1964 regional use estimates. It is expected that the 1980 demand will be met. For 2000 and 2020, sport fishing needs will be 7.7 million and 19.1 million angler days, respectively.

Hunting demand is also expected to increase 20 percent by 1980, 60 percent by 2000, and 119 percent by 2020 over 1964 use. In terms of hunting days the needs are as follows: 1980 - 5.6 million; 2000 - 17.3 million, and 2020 - 34.4 million days of hunting.

In the Appalachian plan fish and wildlife enhancement is closely connected with the recreation developments. Each Corps project was reviewed by the Fish and Wildlife Service to determine its possible influence, favorable or adverse, on wildlife in the region. A separate estimate of the cost and benefits of this purpose was made for each project. In the case of the upstream watershed projects, there were also numerous instances where fish and wildlife would be served, but time did not permit their review.

Sixteen mainstem and 2 upstream watershed projects in the early action plan have

fish and wildlife benefits totalling \$2,381,900 per annum.

General Recreation

The large recreation needs, as estimated for 1980 by the Bureau of Outdoor Recreation, and reflected in Statewide plans, cannot be met by the water resource plan presented here. Further study of how to meet growing recreational needs which are water-oriented is proposed (see Chapter 11).

The major project proposals will add about 93,000 acres of water surface providing about \$20.3 million annual benefits from about 23.8 million recreation days annually. Construction costs allocated to recreation (general and fish and wildlife enhancement) total \$223.7 million. The 42 upstream watershed projects included for early action will add about 4,500 acres of water surface and provide annual benefits of \$4.9 million from 3,200,000 annual days; construction costs allocated to recreation are about \$39.5 million.

The special recreation projects in the National Forests will provide facilities for over 13,000 people at one time at a cost of about \$360.3 million.

Power

The power needs of Appalachia were determined by the Federal Power Commission. In general, the electric power demand of 1980 will be about 3-1/2 times the 1960 demand. By 2020, electric power needs will be seven times that of 1980.

The possibility of developing hydropower was investigated for all major multi-purpose reservoir projects, but only found economically feasible in the St. Petersburg Project, in the Pittsburgh area.

The Appalachian Water Resources Plan has assumed that private power companies will provide the increased electric energy as fast as it is needed to meet the developmental goals of the plan. There has been little attempt in the plan to determine the feasibility of pumped storage power at the potential reservoir sites in

Appalachia which may hold the possibility for power production. Neither has there been any attempt to locate points of water needs for cooling purposes for thermal generating plants, since specific location of future plants is not known. Accordingly, the only aspect of power specifically investigated was that connected with multi-purpose projects in the plan.

Navigation

The Plan proposes that the plans for navigation improvements on the Ohio (Kanawha, Monongahela, Allegheny and Cumberland), Tennessee and Black Warrior River systems be completed and that studies underway on the Chatahoochee be continued.

The Appalachian survey includes a restudy of the economic benefits of the authorized navigation project on the Coosa River, above Montgomery, Alabama. This restudy was required by the Bureau of the Budget, in House Document 320, Eighty-sixth Congress, Second Session, prior to the appropriation of construction funds for the upper portion of the navigation system, above Montgomery. The project is found to be economically feasible and its construction is an integral part of the Appalachian development plan.

Early construction of the authorized Tennessee-Tombigbee Waterway Project is also a vital need.

Economic Expansion

Regional income expansion benefits from the major project proposals are estimated to be about \$573.7 million from over 193,000 new jobs requiring associated investments of over \$4 billion. USDA estimates of expansion benefits for 16 upstream watershed projects included in the early action plan for which expansion benefits were estimated total \$24.2 million, from over 25,000 new jobs, requiring associated investments of about \$488 million.

Legend for the State Summaries

In the plan summaries by states, which follow, the following abbreviations and designations are used:

FWR - Flood Water Retardation Structure;
may be multi-purpose

Status

Aprv - Approved
Auth - Authorized (in USDA - for
installation
AE&D - Advanced Engineering and Design
UC - Under Construction
Op - In Operation
Comp - Completed

Purpose

FC - Flood Control
WS - Water Supply
WQ - Water Quality
P - Power
N - Navigation
R - General Recreation
FWL - Fish and Wildlife
LF - Low Flow Augmentation
ED - Economic Development
I - Irrigation

Page Index to the State Summaries

In the following 13 State Summaries of the Plan, certain plan elements, 19 major projects and 42 selected upstream watersheds, are given special emphasis for early action. To assist the reader in finding the textual matter that pertains to each of these 61 elements, Figure 6-1 displays their location in the Region and gives page references.

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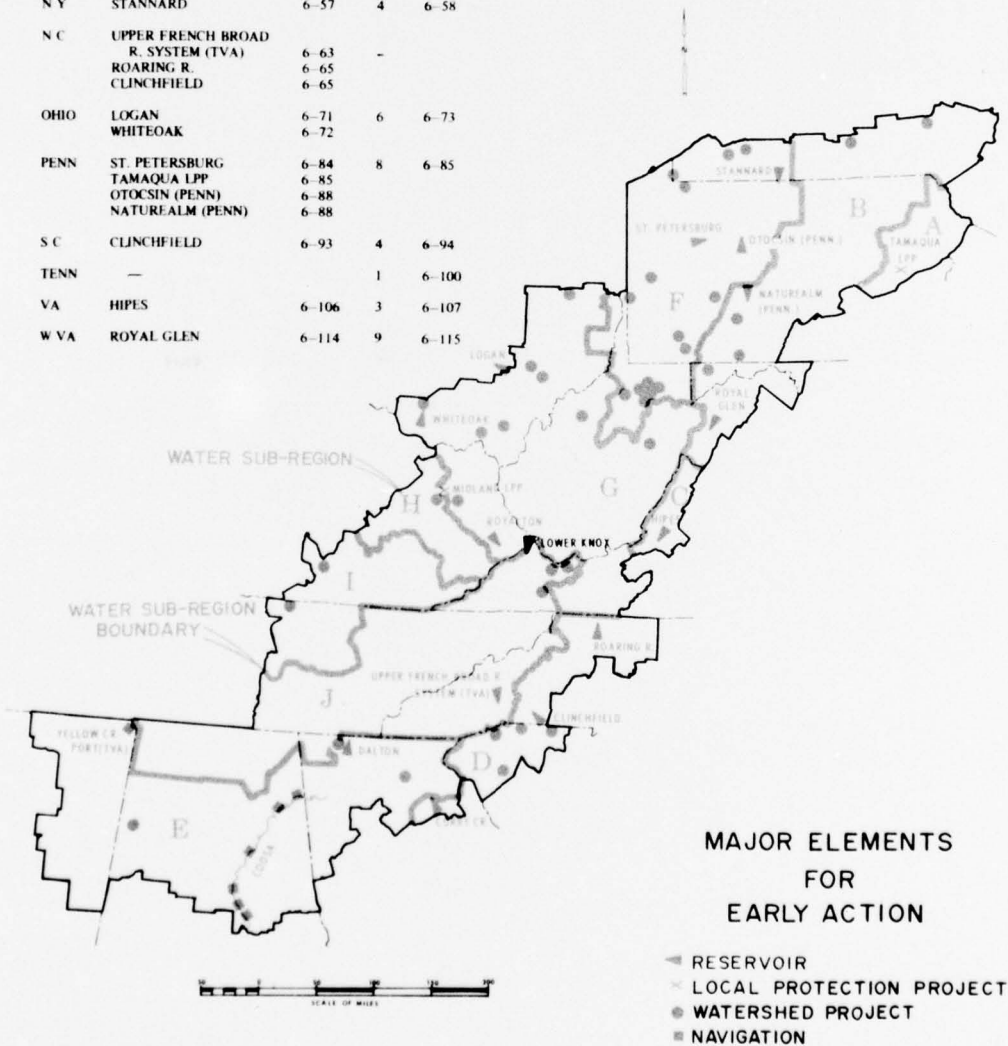


FIGURE 6-1

4. THE PLAN FOR APPALACHIAN ALABAMA

The Appalachian portion of Alabama contains thirty-five counties within the Tennessee, Tombigbee, Black Warrior, Alabama-Coosa and Chattahoochee River Basins. See Map 1, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Chattahoochee River Basin:					
West Point Reservoir	UC	FC,P,R, FWL,LF	15,500	774,798	73.4
Black Warrior River Basin:					
John H. Bankhead Res.	Op	N,P*	8,730	296,200	45.1
Holt Reservoir	Op	N,P*	3,250	118,000	40.0

* Hydropower installed by Alabama Power Company.

(b) Navigation

The Black Warrior-Tombigbee Waterway provides navigation to the Birmingham area from Mobile. Oliver, Holt and Bankhead locks and dams are within Appalachia. By 1971, the Alabama River will be navigable to Montgomery and, when the Coosa Navigation Project is constructed, navigation will be extended to Rome, Georgia.

The Tennessee River Waterway crosses the northern portion of the state and includes navigation locks in the Wilson, Wheeler, and Guntersville projects of the Tennessee Valley Authority. These locks are operated and maintained by the Corps of Engineers.

The plan also recommends that construction of the authorized Tennessee-Tombigbee Waterway be expedited. The Waterway is an integral and necessary element for the development of the Tombigbee River Basin area. Thus, it is essential to continue advanced planning and construction to assure development of the Waterway in time to maintain growth comparable with the development potential of this part of Appalachia. The Waterway, which will be located in Alabama and Mississippi, will have five combination locks and dams plus five individual locks. Of these, the Gainesville and Aliceville locks and dams will be located in Alabama.

(c) Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Alabama Coosa River Basin:					
Black Cr.	Gadsden	Op	Channel	24,150	Urban
Little Cove Cr.	Glencoe	Op	Channel	11,500	Urban
Cahaba R. & Pinchut Cr.	Trussville	Op	Channel	15,080	Urban

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Alabama Coosa River Basin: (cont'd)					
Poley Bridge, Goose Pond & Walnut Cr.	Clanton	Op	Channel	33,500	Urban
Cahaba River	Bibb, Perry & Dallas	Op	Channel	152,750	Agriculture
N. & S. Branches, Little Wells Cr.	Collinsville	Op	Levees	2,020	Urban
Tennessee River Basin:					
Paint Rock River	Jackson, Madison, & Marshall	Op	Channel	280,000	Agriculture
Tombigbee River Basin:					
Buttahatchie River	Marion & Lamar	AE&D	Channel	309,900	Agriculture
Luxapalia Cr.	Fayette & Lamar	AE&D	Channel	105,000	Agriculture
Noxubee River	Pickens	AE&D	Channel	537,500	Agriculture
Sipsey River	Fayette, Tuscaloosa, & Pickens	AE&D	Channel	615,100	Agriculture

(d) *Flood Plain Information Studies*

Within the Greater Birmingham area one flood plain information study has been completed and fourteen more are approved.

(2) *Tennessee Valley Authority*

(a) *Reservoirs*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Tennessee River Basin:					
Wilson Reservoir	Op	FC,P,N	15,400	641,000	630
Wheeler Reservoir	Op	FC,P,N	62,000	1,071,000	356
Guntersville Res.	Op	FC,P,N	65,200	1,052,000	97
Bear Cr. Basin:					
System:*	UC	FC,WS,WQ, R, FWL	8,200	186,000	

* Includes Cedar Creek, Little Bear Creek, Bear Creek, and Upper Bear Creek units.

(b) *Flood Plain Information Studies*

Flood plain information studies have been completed at Athens, Bridgeport, Courtland, Decatur, Florence, Hartselle, Huntsville, Scottsboro, Stevenson, Tuscumbia and for the Tri-county region of Lawrence, Limestone and Morgan Counties.

(3) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Alabama-Coosa River Basin:					
High Pine Cr., Chambers, Randolph	FC,WS	9	19.2	27.40	7,603
Tombigbee-Warrior River Basin:					
Bristows Cr., Etowah	FC,I	2	7.7	5.60	1,858
Little New River Fayette, Marion	FC	3	0	12.03	3,349
Tennessee River Basin:					
Clear Cr., Jackson	FC	-	5.0	-	-
Little Paint Cr., Jackson, Marshall	FC	2	22.4	6.8	1,249

(4) *Non-Federal Reservoirs (Major)*

(a) *Municipal*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Yield MGD</u>
City of Birmingham:					
Inland Lake	Op	WS	12	64,400	50
Lake Purdy	Op	WS	20	17,400	54.5
City of Tuscaloosa:					
North River Res.	UC	WS	1,840	177,000	NA

(b) *Alabama Power Company*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (1,000 KW)</u>
Alabama Coosa River Basin:					
Thurlow Res.	Op	P	505	18,400	58
Yates Res.	Op	P	1,840	54,000	32
Martin Lake	Op	P	33,300	1,630,000	154.22
Walter Bouldin Lake	Op	P			225
Jordan Lake	Op		4,268	233,500	100
Mitchell Lake	Op	P	5,250	177,000	72.5
Lay Lake	Op	P	5,752	241,500	177
Logan Martin Res.	Op	FC,P	11,890	518,600	128.25
H. Neely Henry Res.	Op	P	9,080	121,900	72.9
Weiss Res.	Op	FC,P	19,500	703,400	87.75
Black Warrior River Basin:					
Lewis M. Smith Lake	Op	FC,P	15,100	1,670,600	157.5

The Alabama Power Company dams on the Coosa River have been constructed so that navigation locks can be added by the federal government.

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Navigation*

<u>Project</u>	<u>Features</u>	<u>Estimated Cost</u>
Coosa River Navigation	6 locks, 280 miles channel	\$210 million

A nine-foot navigation channel exists on the Mobile River and an extension on the Alabama River to Montgomery, Alabama, is expected to be completed by 1971. Extension of this channel on the Coosa River to Rome, Georgia, had been authorized subject to a new economic evaluation. It is recommended that this section of the project be reclassified as an active project, on the basis of the economic re-evaluation contained in this report (Volume 8, Chapter 9, Part III). In this respect, state and local plans and preparations for accelerating economic development in the areas served by the project, including Federal re-analysis of traffic savings, should be phased with project planning and construction to permit early realization of development potentials.

The principal feature of the Coosa River navigation project consists of single-lift locks that would be constructed at the existing Alabama Power Company's Walter Bouldin, Mitchell, Lay, Logan Martin, H. Neely Henry and Weiss Dams (see Exhibit 9-1 of Part III). The nine-foot navigation channel, 150 feet wide, from the head of navigation in the Jones Bluff reservoir through an excavated canal to the Walter Bouldin, and then other Coosa River impoundments, and thence to Rome would be 280 miles long. Each of the locks would have a clear length of 600 feet and width of 84 feet, the same as the locks under construction on the Alabama River. The six locks, the highest being the

Walter Bouldin Dam lock with a lift of 127 feet, would provide a total maximum lift of 439 feet. The project also includes the removal of the obsolete Mayo's Bar Lock and Dam about seven miles downstream from Rome, and construction of a low weir on the Oostanula River near its mouth to maintain integrity of Rome's water intake. Dredging in the upper reaches of existing reservoirs on the Coosa River would be required to provide a nine-foot channel. Excavation of a spur channel from the waterway in Black Creek at Gadsden to the Republic Steel Corporation plant, a major potential waterway user, would also be necessary. Six railroad and 12 highway bridges would require modification or reconstruction to provide the required navigation clearances of 150 feet horizontal and 42.5 feet vertical above ordinary high water.

Lock replacement feasibility studies for the William Bacon Oliver Lock and Dam in the Black Warrior River at Tuscaloosa should be continued.

2. Flood Plain Information Studies

Flood plain information studies are recommended for the following communities:

Gadsden	Wetumpka
Anniston	Centreville
Talladega	Port Birmingham
Childersburg	Cordova
Sylacauga	Tuscaloosa-Northport

(b) Tennessee Valley Authority

1. Local Protection Projects

An investigation for a potential local flood protection project is in progress at Athens by the TVA.

2. Flood Plain Information Studies

Flood plain information studies by TVA are recommended for Guntersville, Muscle Shoals and Sheffield.

(c) U.S. Department of Agriculture Upstream Watershed Projects

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Alabama-Coosa River Basin:					
Blue Eye Cr., Calhoun, Talladega	FC	2	9.2	7.97	2,185
Cheaha Cr., Clay, Cleburne, Talladega	FC	5	17.4	50.31	10,547
Choccolocco Cr., Calhoun, Clay, Cleburne	FC,WS,R	15	52.5	116.95	46,306

Project & County	Purposes	Structures		Drainage	Total Storage (AF)
		FWR (No.)	Chan. (Mi.)	Area Controlled (Sq. Mi.)	
Alabama-Coosa River Basin: (cont'd)					
Crooked Cr., Clay, Randolph		6	13.6	29.96	9,064
Lost Cr., Carroll, Cleburne	FC	4	0	13.62	3,272
Mill Cr., Autauga, Elmore	FC	1	2.2	7.31	4,128
Terrapin Cr., Calhoun, Elmore Cherokee	FC	10	17.4	121.60	23,861
Ketchepedrake Cr., Clay, Cleburne, Randolph	FC	5	13.4	29.10	7,372
Cahulga Cr., Cleburne	FC,WS	1	-	6.54	3,102
Tennessee River Basin:					
Big Coon Cr., Jackson	FC	0	8.3	-	0
Big Nance Cr., Lawrence	FC,WS	10	60.3	46.11	13,615
Crowdabout Cr., Cullman, Morgan, Lawrence	FC	8	28.6	15.72	5,071
Hurricane Cr., Jackson, Mackson	FC	7	14.4	40.31	10,867
Town Cr., Colbert, Franklin, Lawrence	FC,I	15	71.0	72.71	24,288

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *U.S. Department of Agriculture*

1. *Watershed Project (For Early Action)*

Project & County	Purposes	Structures		Drainage Area Controlled (Sq. Mi.)	Total Storage (AF)	Estimated Structural Cost (\$000)
		FWR (No.)	Chan. (Mi.)			
Luxapalila Cr., Fayette, Lamar, Marion, Pickens	FC,WS,R	27	29	114.2	46,455	4,844

The Luxapalila Creek Upstream Watershed project would contain five multi-purpose structures and could provide water supply to urban and rural areas of the Fayette-Vernon-Hamilton growth area such as Guin, Winfield and Millport. Also, the watershed project would supplement the Corps channel project in the lower reaches near Columbus, Mississippi.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Sipsey Creek, Dyne Creek, Jacks and Socapotay, Little Sandy Creek, Mahan Creek, Wehadkee Creek, Mill Creek, Cypress Creek, Limestone Creek, Cane Creek, and Little Bear Creek. In addition, the following projects developed in a Tombigbee River Basin Study, (See Table XXXE, Appendix A), are recommended for accelerated planning: Scooba and Bodka Creek, Little Buttahatchie River, Yellow Creek, Woolbank, Beaver and Blubber Creeks, Lubbub Creek, New River and Barrow Creek. These watersheds could provide 91,000 acre feet of storage for flood prevention; 5,600 acre feet for recreation; 2,700 acre feet for municipal and industrial water supply at an estimated first cost of \$18,900,000. Average annual benefits for these projects would total an estimated \$964,500.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	175,060	5,610
Grassland			
Plantings	Acres	124,930	1,156
Renovation	Acres	41,420	383
Critical Area Stabilization			
Roadbanks	Acres	43,210	15,124
Surface Mined Areas	Acres	1,480	111
Recreation and Wildlife Land			
Farm Ponds	No.	599	258
Pond Management	No.	3,080	200
Recreation Access Roads	Miles	2	40
Wildlife Habitat Development	Acres	5,970	430
Wildlife Habitat Preservation	Acres	7,600	15
Picnic Areas	Acres	190	295
Camping Areas	Acres	70	350
Recreation Area Planting	Acres	90	18
Conservation Plans	No.	3,110	720
Soil Survey	Acres	892,490	290
Forest and Woodland			
Management Plans	No.	2,780	472
Tree Planting	Acres	314,000	8,067
Erosion Control	Acres	131,000	4,470
Harvest Cutting	Acres	204,600	778
Hydrologic Stand Improvement	Acres	300,300	4,715
Woodland Grazing Control	Acres	207,200	653
Total			44,155

4. *Forest Service Accelerated Treatment Program*

The accelerated land treatment measures in the Talladega and William B. Bankhead National Forests are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	65,537	3,714
Timber Stand Improvement	104,870	2,064
Soil and Water		
Gully Stabilization	94	47
Sheet Erosion Control	460	67
Streambank Stabilization	121	151
Stream Channel Clearing	408	17
Rehabilitated Abandoned Roads and Trails	3,925	195
Mined Area Stabilization	11	11
Soil Survey	554,000	166
Watershed Analysis	636,000	195
Fish and Wildlife	261,200	6,636
Total		13,263

5. *Forest Service Recreation Development*

The Forest Service has two recreation development programs for the forests in Alabama. One, in the William H. Bankhead Forest, would be at Lake Lewis Smith (Alabama Power Co.). Located about 50 miles north of Birmingham, major recreation complexes on this lake could provide water oriented opportunities for 4,500 persons-at-one-time. This development is accessible from I-65 by U.S. 278 and U.S. 78. Annual visitor-days use by 1980 is expected to be 150,000. The estimated cost is \$4,000,000.

In the Talladega National Forest, a scenic drive is recommended. This proposed 75-mile drive would be used by 2 to 5 million people annually. Recreation facilities at four proposed PL-566 lakes and other recreation development for 1,750 persons-at-one-time will be needed. The drive crosses I-20 west of Heflin and is easily reached from U.S. 278, 280 and 231. Annual visitor-day use by 1980 is estimated to be 150,000. The estimated cost is \$13,800,000.

(3) *Major Continuing Studies*

Continuation of current studies of the Black Warrior River Basin, with emphasis on water supply and water quality control needs in the Birmingham area, water quality control needs in the Tuscaloosa area and local flood protection at Tuscaloosa, is recommended. Reservoirs identified for continued planning are Smiths Ford, Blountsville, and Arkadelphia. As a portion of the Tombigbee River Basin study, water supply at Hamilton and flood control in rural areas throughout the basin should be investigated. The Yellow Creek and Hamilton Reservoirs have been identified for continued planning in this study. USDA should also continue upstream watershed studies as their share of the studies.

(4) *Future Studies*

Studies should be made as needed in the Alabama Coosa River Basin to meet emerging flood control, water supply and water quality needs.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

5. THE PLAN FOR APPALACHIAN GEORGIA

The Appalachian portion of Georgia, which contains 35 counties in the northern portion of the state, lies within the Tennessee, Savannah, Altamaha, Chattahoochee and Alabama-Coosa River Basins. See Map 2, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Alabama-Coosa River Basin:					
Allatoona	Op	FC,LF,P	3,250	671,000	74
Carters	UC	FC,P	1,750	472,800	500
Savannah River Basin:					
Hartwell Reservoir	Op	FC,LF,P	56,000	2,842,700	330
Chattahoochee River Basin:					
Lake Sidney Lanier	Op	FC,LF,P	22,440	2,554,000	86
West Point Reservoir	UC	FWL,LF	15,500	774,798	73.4

(b) Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Coosa & Oostanaula Rivers	Rome	Op	Levee Flood Wall	9,010 546	Urban
Armuchee Cr.	Floyd & Chattoga	Op	Channel	83,000	Agriculture

(c) Flood Plain Information Studies

Reports on eleven of the 45 streams included in the flood plain information program for the Atlanta area have been completed. Also a preliminary study has been made for the Chatahoochee River between Atlanta and Lake Sidney Lanier.

(2) *Tennessee Valley Authority*

(a) *Reservoirs*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Tennessee River Basin:					
Blue Ridge Lake	Op	P	2,800	196,500	20
Nottely Lake	Op	FC,P,N	2,300	174,300	15
Chatuge Lake	Op	FC,P,N	5,300	240,500	10

(b) *Flood Plain Information Studies*

Flood plain information studies have been completed for Chickamauga, Ft. Oglethorpe, McCaysville, Rossville, and Walker County. Work is underway on studies for Ringgold and Trenton.

(3) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Savannah River Basin:					
N. Fork Broad R., Franklin & Stephens	FC	12	36	23.60	5,799
Tennessee River Basin:					
Hightower Cr., Towns	FC	4	10	6.29	842
Altamaha-Oconee River Basin:					
Barber Cr., Barrow & Oconee	FC	4	11	11.10	2,517
Marbury Cr., Barrow & Oconee	FC,WS,FWL	3	13	12.60	6,870
Appalachicola-Chattahoochee River Basin:					
Hazel Cr., Habersham	FC,WS	4	9	8.08	1,940
Sautee Cr., Habersham & White	FC,R	5	8	11.00	2,977
Alabama-Coosa River Basin:					
Amicalola Cr., Lumpkin, Pickens, Cherokee & Dawson	FC	4	0	15.95	3,409
Settingdown Cr., Cherokee & Forsyth	FC	15	25	29.30	6,765
Mill Cr., Walker & Whitfield	FC,WS	6	17	23.43	5,742
Jacks R., Fannin, Murray & Polk	No treatment necessary				

(4) *Non-Federal Reservoirs - Georgia Power Company*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Savannah River Basin:					
Burton Lake	Op	P	1,000	108,000	6.1
Lake Rabun	Op	P	834	31,000	16.0
Nacoochee Lake	Op	P	240	2,500	4.8
Tallulah Falls Res.	Op	P	63	2,400	72.0
Tugaloo Lake	Op	P	597	11,000	45.0
Yonah Lake	Op	P	325	3,500	22.5

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>	<u>Estimated Cost (\$000)</u>
Trotters Shoals	P,R,FWL	26,000	1,166,200	300	89,700

2. *Navigation*

The Coosa River Navigation Project (Volume 8, Chapter 9, Part III) which would extend navigation from Montgomery, Alabama, to Rome, Georgia, has been favorably restudied. Within Georgia, the project includes the removal of the obsolete Mayo's Bar Lock and Dam about 7 miles downstream from Rome, and construction of a low weir on the Oostanaula River near the mouth to maintain integrity of Rome's water intake. Dredging in the upper reaches of the existing Weiss Reservoir would be required to provide a 9 foot channel. One bridge on Georgia Highway No. 100 will require modification to permit the required clearance. The cost for extending navigation from Montgomery, Alabama, to Rome, Georgia, is estimated to be \$210 million.

3. *Flood Plain Information Studies*

Flood plain information studies are recommended for the following communities in Appalachian Georgia: Dahlonega, Gainesville, Dalton, Calhoun, Ellijay, Canton, Allatoona Dam to Rome, Rome, Cedar Town, Rockmart, Summerville, Carrollton, Athens, Winder, Commerce, and Jefferson. In addition to the above, a number of flood plain management studies are being made for the Atlanta area.

(b) *U.S. Department of Agriculture Upstream Watershed Projects*

Project & County	Purposes	Structures		Drainage Area Controlled (Sq. Mi.)	Total Storage (AF)
		FWR (No.)	Chan. (Mi.)		
Savannah River Basin:					
Grove River, Bank & Jackson Middle Fork	FC,WS	11	35	57.70	17,635
Broad River, Banks Franklin, Habersham & Stephens	FC	10	25	42.69	8,693
N. Broad R., Franklin, Hart, & Stephens	FC	8	24	19.60	4,872
Hudson R., Banks, Franklin, & Madison	FC,I	17	51	107.40	26,713
S. Fork Broad River Clarke, Madison & Oglethorpe	FC,WS,I	9	30	62.70	16,607
South R., Clarke & Madison	FC	8	19	55.80	14,270
Tennessee River Basin:					
Head of Little Tenn. R., Rabun & Macon	FC	2	13	21.53	2,821
Hiawassee R., Towns	FC,R	2	0	29.70	6,017
Altamaha-Oconee River Basin:					
Haynes Cr. - Brushy Fork, Gwinnett, Rockdale & Walton	FC	4	14	6.70	1,683
Little Sandy & Trail Cr., Clark, Jackson & Madison	FC,R	6	14	37.20	11,843
Middle Oconee - Walnut Cr., Hall & Jackson	FC,WS	20	46	86.30	25,281
Sandy Cr., Jackson & Madison	FC	6	15	16.30	3,769
Appalachicola-Chattahoochee River Basin:					
Suwanee R., Gwinnett & Hall	FC	3	14	16.60	4,384
Tesnatee R., Lumpkin & White	FC,WS,R	7	11	23.60	7,856
Alabama-Coosa River Basin:					
Allatoona Cr., Bartow, Cherokee Cobb & Paulding	-	-	-	-	-

Project & County	Purposes	Structures		Drainage Area Controlled (Sq. Mi.)	Total Storage (AF)
		FWR (No.)	Chan. (Mi.)		
Alabama-Coosa River Basin: (cont'd)					
Cartecay R., Dawson, Fannin, Gilmer & Pickins	FC	7	0	50.07	8,656
Elhjay R., Fannin & Gilmer	FC	8	0	44.87	8,576
Etowah R. Reach, Dawson, Fannin, Forsyth & Lumpkir	FC	18	19	87.32	22,472
Little R., Cherokee, Cobb, Forsyth & Fulton	FC	14	37	37.04	7,876
Little Tallapoosa R., Carroll & Haralson	FC,WS	14	35	62.25	18,867
Long Swamp Cr., Cherokee, Dawson & Pickens	FC	6	0	43.57	9,992
Lower Little Tallapoosa R., Carroll, Haralson & Heard	FC,WS,R	27	63	128.30	46,489
Mill-Canton Cr., Cherokee & Forsyth	FC	8	1	22.44	5,463
Mountaintown Cr., Fannin & Gilmer	FC	4	0	25.33	5,315
Noonday Cr., Cherokee & Cobb	FC	13	24	22.28	5,791
Pumpkinvine Cr., Bartow, Cobb & Paulding	FC	18	30	73.87	19,811
Raccoon Cr., Bartow, Paulding & Polk	FC	5	0	44.60	11,192
Sharp Mountain Cr., Cherokee & Pickens	FC	14	49	38.90	9,963
Talking Rock Cr., Gilmer, Cordon, Murray & Pickens	FC	6	11	25.72	7,235
Big Cedar Cr., Floyd & Polk	FC,R	11	29	42.00	15,049
Euharlee Cr., Bartow, Floyd, Haralson & Polk	FC,R	12	30	51.19	15,724
Stamp-Shoal Cr., Bartow, Cherokee & Pickens	FC	2	0	14.76	3,454
Little R., Haralson	FC,WS	6	19	24.32	8,565
Pine Log Trib., Bartow, Cherokee & Gordon	FC,R	16	28	81.32	24,500
Sallacoa Cr. Area, Bartow, Cherokee, Gordon & Pickens	FC,WS,R	18	26	67.37	20,165

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield WS (mgd)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
Curry Cr.	FC,WS,R, FWL,ED	5,720	60	180,000	17,757
Dalton	FC,WS,R, WQ,FWL,ED	8,650	137	186,000	44,300

1. *Curry Creek Reservoir (Volume 7, Chapter 7, Part III)*

Principal physical features are the 1,200 foot dam consisting of a 700-foot concrete section, including a 90-foot gated spillway, and impervious earthen embankments; a 180-foot dike, 12 feet high, in a saddle northeast of the dam; and an initial outdoor recreation facility surrounding the 5,720 acre lake. The maximum height of the dam is 85 feet, and the capacity of the reservoir is 180,000 acre-feet, equivalent to about 18.6 inches of run-off. This project would provide water supply, flood control, recreation opportunities, and aesthetic enhancement. During pre-construction studies the project is to be examined to determine whether water quality control storage will be required. Associated with the project will be the development of eleven downstream fishing access areas containing a total of 11 acres.

The water supply storage of the reservoir will meet present needs and the specific projected demands of the cities of Athens and Commerce and Jefferson and other parts of the study area to year 2020. Assurance of an adequate water supply will eliminate an effective deterrent to future economic growth and encourage development of water districts and other water supply systems to serve the area. Flood damages along the downstream North Oconee River above Athens will be virtually eliminated. Damages in Athens will be sharply reduced, and along the river below Athens appreciably diminished. Operational releases of occasional impoundments of floodwaters and from conservation storage to downstream water supply diversion points will alleviate objectionable channel and streamside conditions which presently develop during seasons of deficient streamflow. The 5,700 acre reservoir and recreation facilities adjacent thereto are expected to provide 1,500,000 recreation days annually by about year 2020. The reservoir, downstream fisheries, and 700 acres of lands to be provided for wildlife use are expected to provide 98,200 user days for fish and wildlife pursuits. The provision of additional employment opportunities both during and after project construction would support the projected economic development.

Annual costs and benefits are estimated at \$946,000 and \$1,146,000, respectively. Developmental annual benefits are \$4,284,000, and annual developmental costs are \$431,000.

2. *Dalton Reservoir (Volume 8, Chapter 8, Part III)*

This project features a 186,000 acre-foot reservoir (when full) impounded by a 1,540 foot long, 85 foot high earthen dam controlling 624 square miles of drainage. The reservoir with a surface area of 8,650 acres will have 5,600 acres of land with appropriate public use facilities for general outdoor recreation. Associated with the project would be six public access sites containing 12 acres (primarily for fishermen) spaced along the Conasauga River below the dam. This project, which will

have major economic impact in Appalachia, will provide water supply and water quality control to meet the needs of the expanding tufted carpet industry for the growth center of Dalton-Calhoun. Water supply needs in the area are so critical that there is a possibility that local interests may wish to erect a low dam on the Conasauga River before this project can become operational. Providing Dalton Reservoir is authorized and expenditures after that time are fully coordinated with the Mobile District Engineer, savings to the Federal Government from reductions in total construction cost because of earlier works by local interests would be applied as a local contribution to the project.

Flood damages would be considerably reduced along about 73 miles of the river system south of the dam. Farms would receive benefits in that new flood plain acreage would become available for more intensive use. Extensive new opportunities for water related recreation would be provided by the reservoir with its irregular shoreline. Reservoir fishing facilities and sites on the stream reach below the dam would provide a substantial gain in fishing opportunities. Project occasioned works would conserve existing trout fisheries in the streams emptying into the reservoir. The project will provide for a net gain of 186,700 man-days of fishing and 2,180,000 visitor-days ultimately for general recreation use.

Annual costs and benefits are estimated at \$2,640,000 and \$2,860,000, respectively. Annual developmental costs and benefits are \$44,470,000 and \$118,620,000, respectively.

(b) *U.S. Department of Agriculture*

1. *Watershed Projects (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>			
Chattahoochee River Basin: Wahoo-Little R., Hall, Lumpkin & White	FC,WS	5	4	28.5	6,925	567
Alabama-Coosa River Basin: Headwaters Chattooga R., Chattooga & Walker	FC,WS,R,WS	8	23	73.8	25,435	3,780

The Wahoo-Little River upstream watershed project in northeastern Georgia, would provide flood control and water supply for the Gainesville Growth area. This project plus the existing Santee and Hazel Creek projects and the authorized Tennesse Creek project would reduce annual flood damages in this area from \$101,600 to about 28,000 dollars.

The Headwaters Chattooga River upstream watershed project, which consists of 8 reservoirs with 20,300 acre feet of flood detention storage and 4,200 acre-feet of municipal and industrial water supply storage, would provide the majority of the needs of the Summerville-LaFayette growth area.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: North Oconee River, Young Cane Creek, Mill Creek area, and Peavine Creek. These watersheds could provide 22,800 acre-feet of storage for flood prevention: 400 acre-feet for recreation; 1,800 acre-feet for municipal and industrial water supply at an estimated first cost of \$4,866,000. Average annual benefits for these projects would total an estimated \$360,700.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	105,350	2,321
Grassland			
Plantings	Acres	83,340	792
Renovation	Acres	30,430	289
Critical Area Stabilization			
Roadbanks	Acres	6,810	2,384
Surface Mined Areas	Acres	1,190	89
Recreation and Wildlife Land			
Farm Ponds	No.	86	39
Pond Management	No.	2,580	167
Recreation Access Roads	Miles	24	434
Wildlife Habitat Development	Acres	4,960	357
Wildlife Habitat Preservation	Acres	56,950	114
Picnic Area	Acres	260	403
Camping Area	Acres	110	551
Recreation Area Planting	Acres	120	24
Conservation Plans	No.	3,670	560
Soil Survey	Acres	2,324,990	470
Forest and Woodland			
Management Plans	No.	3,150	537
Tree Planting	Acres	446,800	11,483
Erosion Control	Acres	256,000	2,755
Harvest Cutting	Acres	170,100	647
Hydrologic Stand Improvement	Acres	209,700	3,355
Woodland Grazing Control	Acres	201,200	637
Total			28,408

4. *Forest Service Accelerated Treatment Program*

The accelerated land treatment measures in the Chattahoochee National Forest are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	88,440	5,359
Timber Stand Improvement	153,860	3,070
Soil and Water		
Gully Stabilization	115	57
Sheet Erosion Control	150	22
Streambank Stabilization	209	259
Stream Channel Clearing	292	28
Rehabilitated Abandoned Roads and Trails	5,770	288
Mined Area Stabilization	7	6
Soil Survey	812,500	244
Watershed Analysis	1,002,000	300
Fish and Wildlife	407,280	9,901
Total		19,534

5. *Forest Service Recreation Development*

The Forest Service has four recreation development programs for the forests in Georgia. It proposes to purchase Lake Marvin in Floyd County, a 50-acre lake near Interstate 75 and northwest of Calhoun, Ga. Over 1,500 persons at one time could use the planned developments. It would be accessible from the proposed Blue Ridge Parkway Extension, and from I-75 and I-59. Annual visitor-day use by 1980 is expected to be about 500,000, and the cost is estimated to be 850,000 dollars.

No major public recreation developments are currently available on Nottely Lake (TVA) in Union County. Over 1,700 persons at one time could be accommodated at one major complex. It would be easily reached from Appalachian Corridor A. Annual visitor-day use by 1980 is estimated to be 150,000. The estimated cost is 1,000,000 dollars.

The proposed recreation complexes of Turkey Pen, Mud Creek and Noontotia in Fannin, Union, Lumpkin, and White Counties are needed to meet demands of users of the proposed Blue Ridge Parkway Extension, Brasstown Bald, and Russell Memorial Highway. Two 25- to 50-acre impoundments and related developments could be used by 3,400 persons at one time. These would be readily accessible from the Blue Ridge Parkway Extension, I-85, and Appalachian Corridor A. Annual visitor-day use by 1980 is expected to be 500,000. The estimated cost is 2,250,000 dollars.

The Rock Creek Complex in Murray County is the fourth complex proposed. This complex would be centered around a 25- to 50-acre impoundment. Including the purchase of 5,100 acres of land, this project would provide capacity of 1,700 persons at one time. It is readily accessible from Appalachian Corridor A and I-75. Annual visitor-day use by 1980 is expected to be nearly 600,000 persons. The cost is estimated to be 1,750,000 dollars.

(3) *Major Continuing Studies*

The plan calls for the continuation of current studies of the Chattahoochee River Basin with emphasis on water supply, and water quality control needs in the Atlanta area, and flood protection of urban areas at West Point. Navigation on the Chattahoochee from Columbus to Atlanta is also to be studied. Rosewell, Newman, and Franklin Reservoirs sites have been identified for continued planning in this study area. Continuation of current studies, under special continuing authority, for local flood protection at Cave Spring, Georgia is also recommended.

An investigation of water resource development needs by TVA in the Chattanooga, Tennessee urban and urban-fringe area of northwest Georgia is under way. The study includes all aspects of water resource development as an element of overall planning for economic growth in the Walker, Catoosa, and Dade County area.

(4) *Future Studies*

Studies should be made as needed in the Alabama-Coosa River Basin to meet emerging flood control, water supply, and water quality needs.

Water quality management in the Upper Savannah and the Upper Oconee River Basins should also be studied as well as the proposed multi-purpose reservoir at Tallow Hill site.

After 1990, plan the remaining feasible watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

6. THE PLAN FOR APPALACHIAN KENTUCKY

The 49 Kentucky counties in Appalachia lie in the Ohio River Basin portion of west-central Appalachia, being drained by the Ohio River via the Big Sandy, Little Sandy, Licking, Kentucky, Green and Cumberland River Systems. See Map 3, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Big Sandy River Basin:					
Dewey	Op	FC,R	1,100	93,300	-
Fishtrap	Op	FC,WQ,R	1,131	164,600	-
Paintsville	AE&D	FC,WQ,R	840	76,400	-
Yatesville	AE&D	FC,WQ,R	1,375	99,800	-
Little Sandy River and Tygarts Creek Basin:					
Grayson	Op	FC,WQ,R	1,500	118,990	-
Licking River Basin:					
Cave Run	UC	FC,WQ,R	8,270	614,100	-
Kentucky River Basin:					
Booneville	AE&D	FC,WQ,R	3,050	450,100	-
Buckhorn	Op	FC,R	1,230	168,000	-
Carr Fork	UC	FC,WQ,R	710	47,700	-
Red River	UC	FC,WQ,WS,R	1,510	162,700	-
Green River Basin:					
Green River	Op	FC,WQ,R	8,200	723,200	-
Cumberland River Basin:					
Dale Hollow	Op	FC,P,R	21,880	1,706,000	54.0
Laurel	UC	P,R	4,200	453,600	61.0
Martins Fork	AE&D	FC,WQ,R	270	21,800	-
Wolf Cr. Dam (Lake Cumberland)	Op	FC,P,R	35,820	6,089,000	270.0

(b) Navigation

Markland, Meldahl and Greenup Locks and Dams, and their slack-water pools, which serve Appalachian Kentucky on the Ohio River, have been modernized for increasing traffic to accommodate 1200-foot tows.

Eight of 14 Locks and Dams of the Kentucky River Navigation System are within or partially within Appalachia and provide a six-foot navigable depth from Beattyville, River Mile 255, to the Ohio River (McAlpine Pool). The pools of these locks and dams, constructed in the middle 19th Century, are used extensively for recreation and as sources of water supply.

(c) *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Ohio River Main Stem:					
Ohio River	Ashland	Op	Levee & Wall	14,200	Urban
Ohio & Big Sandy Rivers	Catlettsburg	Op	Levee & Wall	10,000	Urban
Ohio River	Russell	Op	Levee	1,450	Urban
Little Sandy River and Tygarts Creek Basin:					
Tygarts Cr.	Olive Hill	Op	Channel	9,000	Urban
Little Sinking Creek	Grahn	Op	Channel	6,800	Urban
Big Sandy River Basin:					
Beaver Creek	Martin	AE&D	Channel	22,500	Urban
Levisa Fork	Prestonburg	Op	Levee	265	Urban
Right Fork, Beaver Creek	Langley	Op	Channel	11,500	Urban
Right Fork, Beaver Creek	Wayland-Garrett	Op	Channel	36,000	Urban
Left Fork, Beaver Creek	McDowell & Drift	Op	Channel	26,900	Urban
Right Fork, Beaver Creek	Bosco	Op	Channel	11,600	Urban
Kentucky River Basin:					
North Fork Kentucky River	Jackson	Op	Channel	150	Urban
Boone, Yonts & Wright Forks	Neon-Fleming	Op	Channel	5,300	Urban
Rt. & Lt. Forks, Troublesome Cr.	Hindman	UC	Channel	35,500	Urban
North Fork Kentucky River	Whitesburg	Op	Channel	27,600	Urban
Cumberland River Basin:					
Cumberland River	Barbourville	Op	Levee	19,000	Urban
Lynn Camp Creek	Corbin	Op	Channel	10,800	Urban
Yellow Creek	Middlesboro	Op	Levee & Channel	21,000	Urban
Cumberland River	Pineville	Op	Levee & Wall	10,100	Urban
Yellow Creek	Yellow Cr.	Op	Channel	19,900	Urban

(d) *Flood Plain Information Studies*

Flood plain information studies have been completed at Harlan, Middlesboro and Williamsburg.

(2) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Kentucky River Basin: Red River (Stillwater Cr.), Wolfe	FC	-	6.4	-	-
Green River Basin: Upper Green River, Lincoln	FC	5	12.0	3.7	722
Cumberland River Basin: Meadow Cr., Wayne	FC	-	7.3	-	-

(3) *U.S. Army Ordnance Corps*

<u>Project</u>	<u>Status</u>	<u>Purpose</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Blue Grass Ordnance Reservoir	Op	WS	NA	1,530	-

(4) *Non-Federal Reservoirs (Major)*

<u>Project & County</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Commonwealth of Kentucky:				
Greenbo Lake, Greenup	R	225	NA	-
Beech Cr. Lake, Clay	WS,R	60	1,400	-
Campton Lake, Wolfe	R	35	1,000	-
Fishpond Lake, Letcher	R	40	1,500	-
Kentucky Utilities:				
Herrington Lake	P,WS,R	2,650	123,000	28.3
Harlan County:				
Cranks Cr. Lake	R	200	10,000	-

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENTAL STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Little Sandy River and Tygarts Creek Basin: Kehoe	FC,WQ,R	825	79,000	-
Licking River Basin: Falmouth	FC,R,WS*	12,300	898,300	-
Cumberland River Basin: Celina	P,R,N**	13,150	248,000	108

* Water supply will be added as a purpose during AE&D.

** Navigation would be a purpose at such time as determined to be feasible.

2. *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Big Sandy River Basin: Rockcastle Creek	Inez	Wall & Channel	14,200	Urban
Tug Fork	South Williamson	Levee	-	Urban
Licking River Basin: Triplett Creek	Morehead	Channel	10,600	Urban
Kentucky River Basin: South Fork Kentucky River	Manchester	Channel	45,000	Urban
Cumberland River Basin: Poor Fork, Cumberland R. Yellow Creek	Cumberland Middlesboro	Channel Levee (Yellow Creek Addition)	6,900 6,200	Urban Urban
Crummies Creek Clover Fork & Yocum Creek Straight Creek	Cawood Evarts Pineville	Channel Channel Channel	- 20,000 -	Urban Urban Urban

3. Flood Plain Information Studies

Flood plain information studies are recommended for the following communities: Pikeville, Paintsville, Prestonburg, Lower Big Sandy River (W. Va. & Ky.), Hazard, Irvine-Ravena, Beattyville, Clay City-Stanton, Midland, Whitesburg, Jackson, Corbin, Barbourville, Pineville, Cumberland, and Burkesville and along the main stem of the Ohio River.

(b) U.S. Department of Agriculture Upstream Watershed Projects

<u>Project & County</u>	<u>Purposes</u>	<u>Structures FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
Licking River Basin: Fox Cr., Fleming	FC,R	5	7.3	25.3	5,718
Green River Basin: Mill Cr., Monroe	FC,R,WS	1	-	7.3	3,360
Cumberland River Basin: Buck Cr., Lincoln	FC	3	10.0	15.0	3,177

(2) Early Action, Authorization or Acceleration of Programs and Project Studies Needed

(a) Interagency

1. Royalton Reservoir-Salyersville Area Project

a. Corps of Engineers

Reservoir:

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield WQ cfs</u>	<u>WS mgd</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
Element 1 Royalton Res.	FC,WQ,WS, R,FWL,ED	1,080	5.3-14.3	2.26	64,500	35,647

Local Protection Project:

<u>Project</u>	<u>Purposes</u>	<u>Location</u>	<u>Channel Improvement (Mi.)</u>	<u>Estimated Cost (\$000)</u>
Element 2	FC,R,ED	Licking River & State Road Fork near Salyersville	15.88*	5,588

* Banks to be landscaped to provide park and playground use.

b. *U.S. Department of Agriculture*

Upstream Watershed Structures:

<u>Project</u>	<u>Purposes</u>	<u>Structures FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
Element 3 Small tributary structures	FC,R,ED	3*	-	16.39	3,605	2,497

* Includes 1 multiple purpose structure with 60 acre conservation pool.

Land Treatment Measures

Element 4
Accelerated Land Treatment - 44,400 acres - \$1,773,000.

The estimated costs of the water elements of the Upper Licking
Project total \$45,505,000.

This project (See Volume 6, Part III, Chapter 1, and Supplement thereto), was cooperatively planned with USDA, Spindletop Research and other Federal and Commonwealth agencies to provide a Designed Potential Urban Service Center to serve a six-county area. Services in this area are currently limited but programmed development indicates that, by design, a full service urban center can and will likely be created, provided other constraints, mostly water related, can be removed.

The plan of improvement consists of five major elements. Four of these elements are concerned with development of the land and water resources of the area. They are: (1) A multiple purpose reservoir on the Licking River at Royalton (CE); (2) Channel improvements of the Licking River and State Road Fork in the vicinity of Salyersville and associated aesthetic development of the changed stream banks (CE); (3) Three small dams and reservoirs (2 floodwater retarding structures and 1 multiple purpose structure) near Salyersville on tributaries of the Licking River (SCS); (4) An accelerated land treatment program on some 44,000 acres in the upper basin (SCS).

The first four elements of the plan - - the water control elements - - will function as an integrated system to alleviate flooding, meet water supply and water quality needs, and provide needed opportunity for outdoor recreation. These user services will provide a favorable physical environment for the private and public investments and attendant economic expansion which comprises the fifth element of the plan.

The fifth element is a plan for the economic, or industrial development of the area, made possible by the water resources elements (by other public, quasi-public and private interests) and is composed of three components. They are: (1) A land use plan which provides for the orderly industrial, commercial, and residential development of about 1,800 acres of previously undevelopable land; (2) A public facilities and utilities plan which includes such items as new schools, health facilities, and enlargement of water supply and sewage treatment facilities; (3) A transportation plan which consists of approximately 21 miles of new and improved streets and highways, and some increased railroad facilities.

2. *Midland, Ky., Project*

a. *Corps of Engineers*

Local Protection Project:

<u>Project</u>	<u>Purposes</u>	<u>Location</u>	<u>Channel (Mi.)</u>	<u>Features Levees (Mi.)</u>	<u>Walls (Ft.)</u>	<u>Estimated Cost (\$000)</u>
Midland LPP	FC,ED	Licking River				
Phase I (1980)		below Cave Run	-	4.7	-	2,640
Phase II (2000)		Reservoir	-	5.2	250	4,140
Phase III (2020)			0.28	1.4	-	1,450
Total			0.28	11.3	250	8,230

b. *U.S. Department of Agriculture*

Associated Watershed Developments
(For early action by SCS):

<u>Project</u>	<u>Purposes</u>	<u>Status</u>	<u>Structures FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Construction Cost (\$000)</u>
Salt Lick Cr	FC,R,ED	Work plan approved	6*	15.2	16.9	3,486	1,041.7
Triplett Cr	FC,R,ED	Potential AWRS	19**	-	67.4	13,005	3,720.6

* Includes 1 multiple-purpose structure with conservation pool of 40.3 acres.

** Includes 1 multiple-purpose structure with conservation pool of 88 acres.

This project (See Volume 10, Part III, Chapter 16) was cooperatively planned with USDA, ARC, Spindletop Research, the University of Kentucky and other Federal and Commonwealth agencies to provide a Designed Potential Urban Service Center (Primary) to serve a nine-county area. Services in this area (at Morehead, with the University, and at Mt. Sterling), although more advanced than the Upper Licking Area, are still currently limited. The area's location, midway between the Lexington and Ashland-Huntington (SMSA's) Regional Growth Centers; transportation facilities, such as the under construction Interstate 64, existing U.S. 60 and existing C&O Main Line; improvements and facilities of the under construction Cave Run Reservoir, Daniel Boone National Forest, and authorized Falmouth Reservoir; and the availability of about 20,000 acres of developable ridge-top and valley land all combine to create an environment for extensive urban development. Substantial development could and probably would take place without additional water related investments, but as discussed in the referenced Chapter 16, with elimination of residual flood hazards from the uncontrolled Triplett and Salt Lick Creek drainage areas by relatively low cost structural measures (together with the availability and potential of other water related goods and services such as water supply, water quality control and recreation), the opportunity would be provided to develop the area to its near optimum with very substantial net gains in population holding capacity and new jobs.

The Midland Project plan of improvement consists of the under-construction Cave Run Reservoir, (CE), Daniel Boone National Forest (FS), and the following four

added major elements: (1) Salt Lick Creek Watershed, including accelerated land treatment (work plan approved) (SCS); (2) Triplett Creek Watershed, including accelerated land treatment, (investigated in AWRS) see Appendix A (SCS); (3) Midland Local Protection Project (CE) (See Part III - Chapter 16); and (4) Development plan (by public, quasi-public, and private interests) for a potential new city of 40,000 to provide 36,000 jobs (including 24,000 primary jobs).

At time of writing, a public hearing on this project had not been held, but was imminent.

(b) *U.S. Department of Agriculture*

1. *Watershed Project (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>	<u>Estimated</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>		
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>Storage</u>	<u>Structural</u>
				<u>(Sq. Mi.)</u>	<u>(AF)</u>	<u>Cost (\$000)</u>
Russell Creek Adair, Green & Russell	FC,R,WS	7	0	158.4	42,575	3,344.0

Russell Creek Watershed should be further investigated for potential of meeting the water supply need at the potential growth center of Columbia, reducing flood damage to agricultural lands and providing water oriented recreational opportunities.

2. *Upstream Watershed Projects (For Acceleration)*

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Grassy Creek in the Licking River Basin; Little Fork of Little Sandy, and East Fork Little Sandy in the Little Sandy River Basin; Redlick, Upper Howard, Hanging Fork, and Silver Creeks and Upper Red River in the Kentucky River Basin; Casey Creek in the Green River Basin; and Richland, Marsh and Marrowbone Creeks in the Cumberland River Basin. These projects could provide 68,600 acre-feet of storage for flood prevention; 6,000 acre-feet for recreation; and 800 acre-feet for municipal and industrial water supply at an estimated first cost of 9,910,000 dollars. Average annual benefits would total an estimated 531,000 dollars.

3. *Land Treatment Measures*

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u>
			<u>(\$000)</u>
Cropland	Acres	267,280	4,928
Grassland			
Plantings	Acres	550,500	3,598
Renovation	Acres	613,320	3,978
Critical Area Stabilization			
Roadbanks	Acres	5,860	1,978
Surface Mined Areas	Acres	48,180	2,554

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u> <u>(\$000)</u>
Recreation and Wildlife Land			
Farm Ponds	No.	1,448	623
Pond Management	No.	1,480	96
Recreation Access Roads	Miles	23	416
Wildlife Habitat Development	Acres	12,080	870
Wildlife Habitat Preservation	Acres	68,940	138
Picnic Area	Acres	5,430	8,418
Camping Area	Acres	2,160	10,830
Recreation Area Planting	Acres	2,490	499
Conservation Plans	No.	31,780	8,150
Soil Survey	Acres	29,365,340	14,280
Forest and Woodland			
Management Plans	No.	3,730	635
Tree Planting	Acres	172,300	4,418
Erosion Control	Acres	179,700	6,146
Harvest Cutting	Acres	400,500	1,522
Hydrologic Stand Improvement	Acres	475,900	7,614
Woodland Grazing Control	Acres	243,000	790
Total			82,480

4. *Forest Service Accelerated Treatment Program*

The accelerated land treatment measures in the Daniel Boone National Forest and the part of the Jefferson National Forest in Letcher County are:

<u>Measure</u>	<u>Amount</u> <u>(Acres)</u>	<u>Costs</u> <u>(\$000)</u>
Timber		
Tree Planting	23,705	1,394
Timber Stand Improvement	100,761	2,032
Soil and Water		
Gully Stabilization	1,292	648
Sheet Erosion Control	3,342	501
Streambank Stabilization	2,134	2,652
Stream Channel Clearing	875	102
Rehabilitated Abandoned Roads and Trails	2,338	119
Pollution Abatement	24	12
Soil Survey	312,000	83
Watershed Analysis	500,000	142
Fish and Wildlife	210,000	659
Range Management	36	10
Total		11,021

5. *Forest Service Recreation Development*

Accelerated recreation has been proposed by the Forest Service at six locations in Kentucky. These, in order of priority are:

Cave Run Reservoir - When completed, the Corps of Engineers reservoir project is expected to attract about one million visitors annually. As currently planned, developments of this reservoir include major resort-type developments, marinas, camping, picnicking, swimming, boat ramps, docks, and dispersed hiking, riding, sightseeing, fishing and hunting opportunities. The estimated development cost is \$15,000,000.

Red River Complex - As envisioned, the Red River Gorge project would include a scenic highway between Mountain Parkway, Red River Reservoir, Cave Run Reservoir, and Interstate 64. This 25-mile scenic highway would cost an estimated \$25,000,000. Land acquisition needs, including easements, are estimated to be 66,000 acres costing an estimated \$4,400,000. Access and interior roads costs, exclusive of the proposed scenic highways, are about \$2,000,000. Recreation developments highlighting the various natural rock arches, escarpments and historical features would cost an estimated \$7,000,000. The total estimated development cost is \$38,400,000.

Laurel River Reservoir - As envisioned, project requirements include 17 miles of primary access roads, 15 miles of interior access road construction, 2,000 acres of land to be acquired and 12 recreation site complexes. With Interstate 75 traversing the upper reaches of the reservoir, approximately 8,000 persons at one time can be served. Plans are to serve the needs of surrounding local populations, and those vacationists visiting the reservoir, as well as those enroute to other vacation destinations. Exclusive of all road, land acquisition costs and private financing for resort and marina developments on National Forest land, the estimated cost is \$3,500,000.

As the Corps of Engineers' plans and programs are activated, additional recreation development needs will materialize. Preliminary estimates of these recreation needs include:

Parkers Branch Reservoir and Rockcastle Reservoir - An estimated \$9,000,000 recreation development program will be required along with about \$9,000,000 for road access and parking. The total estimated development cost for Parkers Branch is \$10,000,000 and Rockcastle \$8,000,000 for a total cost of \$18,000,000.

Devils Jumps Complex - The alternatives formulated by the Devils Jumps Reservoir and South Fork of the Cumberland River Wild and Scenic River Special Studies will eventually lead to some form of recreation program for this unique river segment. This recreation resource, if fully utilized, would require a \$4 to \$6 million development program. Access road construction costs at this project would approach \$15,000,000. The project is located in both Tennessee and Kentucky, with estimated construction costs of about \$20,000,000 for the portion in Kentucky.

In addition to the above six projects, the Forest Service plans to accelerate its recreation program on the recently authorized Red Bird Purchase Unit in southeastern Kentucky. Acquisitions by the Forest Service of available and desirable land is now in progress. The area includes two Corps of Engineers reservoirs; Buckhorn Reservoir, which is constructed near Hazard, and Booneville Reservoir, which is under advanced planning. Estimated annual visitor day use needs in the area by 1980 are about 500,000 persons. An initial planning investment, along with minimum developments to serve approximately 2,000 persons at one time by 1980, would require an estimated \$1,000,000.

(3) *Major Continuing Studies*

Complete survey-scope review of water and related resource development on Tug Fork, Big Sandy River, with emphasis on flooding and other water and related restraints in Williamson, West

Virginia-West Williamson, Kentucky Growth Area. The Lower Knox Reservoir project, which is presented for consideration (See Volume 9, Chapter 13, Part III), would be located principally in Pike County, Kentucky and extend into Buchanan County, Virginia. It would control 113 square miles of drainage area (amounting to about 12 percent of the area above Williamson). Data would be as follows:

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield WQ cfs</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
Tug Fork, Big Sandy R. Basin: Lower Knox Res.	FC,WQ,R,ED	220	70*	56,240	49,200

* Flow objective at Kermit, West Virginia in conjunction with authorized Panther Creek Reservoir.

The average annual costs for Lower Knox Reservoir are estimated to be \$1,891,000 and \$44,000 for the project and associated developments respectively (at 3-1/4 percent interest rate). Annual benefits (acting in conjunction with Panther Creek Reservoir) to the national and regional accounts are estimated to be \$1,109,100 and \$620,500 respectively. The national and regional indices of performance for the objective of increasing national income would be 0.6; and for increasing regional employment, 0.3. Benefits from the reservoir, even if computed in the most favorable manner with allowance for development and redevelopment benefits, and placing the project in a preferred position with respect to the authorized Panther Creek Reservoir, amount to \$1,487,000, annually.

Using monetary evaluations only, the project cannot be justified. However, the Tug Fork does not present a normal situation. There are several significant factors which have pervasive influence upon the Tug Fork area, factors which may well override the traditional criteria for economic analysis: a. The valley offers now and will continue to offer jobs in mining and associated industries, since about 11 percent of all bituminous coal mined nationally flows out of the general area; b. To be acceptably near their work, the people must use every reasonably level piece of ground for dwellings and businesses; c. The past 14 years have brought damaging floods to these dwellings and businesses with a distressing regularity; and d. Given even moderate flood protection, as at Williamson, the people can be expected to react quickly and tellingly to rebuild, and to institute warning and flood plain management measures.

Another problem concerning this project is assurances for reimbursement under provisions of PL 89-72. This problem stems mostly from the present financial plight of Tug Valley people and the location of the project primarily in Kentucky with beneficiaries being located in the tri-state area of Kentucky, West Virginia and Virginia. Staff responses from each of the three states recognize the local interest in the project and indicate a willingness to explore an interstate arrangement to handle the recreation assurances should the project be authorized.

This project would perform well in meeting the needs of the area for water quality improvement and recreation and would provide flood damage reductions, but would not afford complete protection against large floods for the major damage centers. Accordingly the plan includes continuation of studies of Lower Knox Creek Reservoir with consideration of other cooperative structural and nonstructural alternatives to redesign the growth center so that it can become a viable urban service area.

Other continuing studies follow below.

Continue cooperative Pikeville Model Cities Program - including CE local protection project (multiple purpose channel cutoff) on Levisa Fork.

Complete review report for Licking River Basin with emphasis on satisfaction of water and related resources needs of Salyersville, Midland-Morehead and downstream growth areas.

Continue review report of Kentucky River Basin with early emphasis on special Hazard-Whitesburg study of a North Fork Kentucky River reservoir, and other structural and nonstructural alternatives, or combinations, to redesign growth area so that it can become a viable urban service center; and continue studies of potential National Recreation Area involving both Kentucky and Licking River areas.

Continue studies in Cumberland River Basin with emphasis on: Devils Jumps Reservoir and Alternatives, Big South Fork; Celina Lock and Dam; Wolf Creek Cargo Lift; Rockcastle River Basin Review; Cumberland River Basin Review; Middlesboro Local Protection Project; Norris Reservoir - Cumberland - Scenic Riverway Interstate Complex; and Comprehensive Recreation Study.

Continue USDA participation in the studies of the Green and Kentucky River Basins and Big South Fork of the Cumberland River Basin.

(4) *Future Studies*

In the Kentucky River Basin, as future needs develop, consideration should be given to multiple purpose reservoir development first at the Troublesome Creek and Ford sites, then on Station Camp Creek, Walkers Creek, Red Bird River, Little Goose Creek, Cutshin Creek, and Greasy Creek.

Studies of the effectiveness of the system of flood control reservoirs throughout the Ohio River Basin should be continued after completion of the flood plain information studies along the main stem. These studies should have as goals determination of flood hazard stages at individual developmental sites, and determination of the overall expansion benefits from adding additional flood control storage to the system.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

7. THE PLAN FOR APPALACHIAN MARYLAND

Appalachian Maryland consists of Garrett, Allegheny, and Washington Counties. The western portion of Garrett County is drained by the Youghiogheny and Casselman Rivers (Monongahela River Basin), and the remainder by the Potomac. See Map 4, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
Monongahela R. Basin:				
Youghiogheny River Res.	Op	FC,LF,R	2,850	254,000
Potomac R. Basin:				
Savage River Res.	Op	FC,LF	-	20,000
Bloomington Res.	AE&D	FC,LF,R	952	130,600

(b) Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Monongahela R. Basin:					
Youghiogheny River	Friendsville	Op	Channel	3,000	Urban
Potomac R. Basin:					
North Branch	Cumberland- Ridgeley, W.Va.	Op	Levee, Wall & Channel	17,400	Urban
North Branch	Kitzmillier- Blaine, W.Va.	Op	Levee & Channel	5,800	Urban

(c) Flood Plain Information Studies

Flood plain information studies are in progress in Washington County.

(2) Non-Federal Reservoirs (Major)

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
State of Maryland Projects			
Monongahela R. Basin:			
Deep Creek Lake	P,R	3,900	93,000
Potomac R. Basin:			
Evitts Creek Reservoir	R	240	9,000

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers Flood Plain Information Studies*

It is recommended that flood plain information studies be made for Hagerstown.

(b) *U.S. Department of Agriculture Upstream Watershed Project*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>	
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>Storage</u>
				<u>(Sq. Mi.)</u>	<u>(AF)</u>
Ohio R. Basin:					
L. Youghiogheny R.,					
Garrett	FC,WS,R	6	1.6	14.4	4,000

Recommended for early construction because of its proximity to Oakland Growth Center. Coordination possibly required with potential Corps reservoir on Upper Youghiogheny River.

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Conservation</u>	<u>Total</u>	<u>Estimated</u>
		<u>Pool Area</u>	<u>Capacity</u>	
		<u>(Acres)</u>	<u>(AF)</u>	<u>Cost</u>
				<u>(\$000)</u>
Town Creek Res.	LF,R	1,530	58,000	14,134
Sideling Hill Res.	LF,R	910	55,000	14,610

Town Creek Reservoir on Town Creek and Sideling Hill Reservoir on Sideling Hill Creek are two elements of the plan for augmentation of low flows in the Potomac River. These projects, along with four others, are recommended in the Chief of Engineers Report which is now being processed to the Congress. Annual project costs and benefits for Town Creek Reservoir are estimated to be \$751,000 and \$1,667,000 and for Sideling Hill Reservoir, are estimated to be \$668,000 and \$1,157,000.

(b) *U.S. Department of Agriculture*

1. *Watershed Project (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>	<u>Estimated</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>		
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>Storage</u>	<u>Structural</u>
				<u>(Sq. Mi.)</u>	<u>(AF)</u>	<u>Cost (\$000)</u>
U. Casselman R.	FC,R,FWL,					
Garrett	WS	5	-	60.6	26,260	1,979

Upper Casselman River Watershed (also in Pennsylvania) will form a unit with potential Upper Casselman Reservoir (CE).

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: North Branch, Georges, Little Antietam, Town, Tonoloway, and Licking Creeks. These watersheds could provide 23,800 acre feet of storage for flood prevention; 4,400 acre feet for water quality; 31,100 acre feet for municipal and industrial water supply at an estimated first cost of \$6,523,000. Average annual benefits for these projects would total an estimated \$287,800.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	-	-
Grassland			
Plantings	Acres	7,290	54
Renovation	Acres	16,620	124
Critical Area Stabilization			
Roadbanks	Acres	160	56
Surface Mined Areas	Acres	280	17
Recreation and Wildlife Land			
Farm Ponds	No.	59	26
Pond Management	No.	400	26
Recreation Access Roads	Miles	48	886
Wildlife Habitat Development	Acres	1,340	97
Wildlife Habitat Preservation	Acres	4,450	9
Picnic Areas	Acres	1,370	2,123
Camping Areas	Acres	550	2,753
Recreation Area Planting	Acres	630	126
Conservation Plans	No.	1,430	460
Soil Survey	Acres	-	-
Forest and Woodland			
Management Plans	No.	100	30
Tree Planting	Acres	6,500	130
Erosion Control	Acres	200	136
Harvest Cutting	Acres	1,000	10
Hydrologic Stand Improvement	Acres	2,000	80
Woodland Grazing Control	Acres	300	1
Total			7,144

There are no National Forest lands in Appalachian Maryland. Access to Deep Creek State Park (Md.), the 115,000 acres of state forests and game management areas, the 1,900 acre Garrett County Park, the 770 acre National Park Service (USDI) park and the Chesapeake and Ohio Canal National Monument (NPS) will be greatly improved by the construction of Interstate Highway 70 and Appalachian Highways E, O, and N.

(3) *Major Continuing Studies*

The Comprehensive Survey Report study for the Youghiogheny River Basin should be completed as expeditiously as possible. The advisability of improvements for flood control, water supply, water quality, power, and recreation in both the upper reaches of the Youghiogheny River Basin and in the upper Casselman River, a tributary, should be considered. The formulation of a joint plan of improvement with both the Corps of Engineers and the Department of Agriculture participating should be given early consideration. An interim report for this stream should also be considered.

(4) *Future Studies*

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

8. THE PLAN FOR APPALACHIAN MISSISSIPPI

The Appalachian portion of Mississippi contains 20 northeastern counties. The Tombigbee is the principal river basin of the area with small areas of drainage also in the Hatchie, Coldwater, Tallahatchie, Big Black and Pearl River. See Map 5, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Navigation

A critical need in the water sub-region is the completion of the authorized Tennessee-Tombigbee Waterway for which initial advanced engineering and planning funds have been made available. The Waterway is an integral and necessary element of a comprehensive plan for the development of Appalachian Mississippi, (see Volume 13, Part V, Chapter 5, Mississippi Water Supplement). Thus, it is essential to continue advanced planning and construction to assure development of the Waterway in time to maintain growth comparable with the developmental potential of this part of Appalachia. The Waterway will have five combination locks and dams plus five individual locks. All but two of the locks and dams are located in Mississippi.

The Tennessee Valley Waterway, operated by the Corps of Engineers, touches northeastern Mississippi at Pickwick Lake.

(b) Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Tombigbee River Basin:					
Big Browns Cr.	Itawamba & Prentiss	Op	Channel	18,400	Agriculture
Donivan Cr.	Itawamba	Op	Channel	21,500	Agriculture
Twenty Mile Cr.	Lee & Itawamba	Op	Channel	61,700	Agriculture
Mantachie Cr.	Itawamba	Op	Channel	26,400	Agriculture
West Fork Tombigbee River	Lee & Monroe	Op	Channel	96,624	Agriculture
James Cr.	Monroe	Op	Channel	47,500	Agriculture
Stanefer Cr.	Monroe	Op	Channel	18,850	Agriculture
Luxapalila Cr.	Lowndes, Lamar (Ala) Columbus, Miss.	AE&D	Channel	105,000	Agriculture
Tibbee R.	Lowndes & Clay	AE&D	Channel	125,860	Agriculture
Catalpa Cr.	Clay & Lowndes	AE&D	Channel	44,900	Agriculture
Sakatonchee Cr.	Clay & Chickasaw	AE&D	Channel	166,300	Agriculture
Houlka Cr.	Clay & Chickasaw	AE&D	Channel	118,800	Agriculture
Line Cr.	Clay & Oktibbeha	AE&D	Channel	65,000	Agriculture
North Canal	Clay	AE&D	Channel	30,600	Agriculture
South Canal	Clay	AE&D	Channel	26,400	Agriculture
Johnson Cr.	Clay	AE&D	Channel	16,900	Agriculture
Trim Cane Cr.	Oktibbeha	AE&D	Channel	29,600	Agriculture
Sun Cr.	Clay & Oktibbeha	AE&D	Channel	28,000	Agriculture
Little Browns Cr.	Prentiss & Itawamba	AE&D	Channel	40,100	Agriculture
West Fork Tombigbee R.	Monroe	AE&D	Channel	5,300	Agriculture

(2) *Tennessee Valley Authority Reservoir*

Pickwick Lake brings the Tennessee River navigable waterway along the northeastern border of the state. In addition to this multi-purpose reservoir which offers water-based recreation opportunities, other TVA work in the area includes a flood plain information study which has been completed for the city of Burnsville.

(3) *U.S. Department of Interior Reservoir*

Buff Lake, located in the Noxubee Wildlife Refuge in Noxubee and Oktibbeha Counties, contains 4,800 acre-feet of storage and has a surface area (top of conservation pool) of 600 acres.

(4) *U.S. Department of Agriculture Upstream Watershed Project (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Area Controlled (Sq. Mi.)</u>	
Tombigbee-Warrior Basin: Shammack Cr., Kemper	FC	5	11	5.89	2,215

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers Flood Plain Information Studies*

Flood plain information studies are recommended for Tupelo, Fulton, Aberdeen-Amory and Corinth.

(b) *Tennessee Valley Authority*

I. *Port Facilities*

The following element is recommended for early construction:

Yellow Creek Port. This public port project to be located on Pickwick Lake (Tennessee River) in Tishomingo County is recommended for early construction by the Tennessee Valley Authority in cooperation with the State of Mississippi. The project will provide a terminal, including a dock, warehouse and general yard improvements, and a railroad lead track which will connect the port with the Southern Railway line 12 miles away at a point between Burnsville and Glens. The rail line will serve more than 2,000 acres of adjoining land physically suitable for industry, in addition to waterfront lands near the terminal site which are now in the custody of TVA. Industries which require barge shipments for inputs or finished products will find these sites extremely attractive.

The Yellow Creek Port project thus will provide new opportunities for industrial growth in the Corinth-Booneville-Iuka growth area. It is expected ultimately to attract new industries employing more than 2,800 persons and providing an annual payroll of more than \$20 million. Fifteen existing industries in the area would also benefit from the port facilities. The port can also serve as a terminal for the Tennessee-Tombigbee Waterway when completed.

The Tennessee Valley Authority estimates the cost of the overall plan, including state purchases of industrial land, at about \$17 million. The average annual values of costs and benefits would be \$519,400 and \$2,912,000 respectively, based on an interest rate of 4-7/8 percent over a period of 25 years. The associated developmental investments over the next 25 years are expected to equal \$142 million.

Arrangements are complete for the substantial non-Federal participation which will be required for implementation and operation of the Yellow Creek Port project. The various non-Federal agencies which will take part in the project and general role of each agency are enumerated in Chapter 18 of Part III (Volume 11). The arrangements include a detailed written agreement among the parties which is backed by assured availability of funds to carry out the non-Federal commitments.

2. Flood Plain Information Studies

Flood plain information studies are recommended for Iuka.

(c) U.S. Department of Agriculture - Upstream Watershed Projects

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Yazoo River Basin:					
Crane Cr., Tippah, Union	FC	6	2	5.27	1,617
Coldwater R. Benton					
Desota, Marshall	FC	13	58	63.59	21,045
Cypress & Puss, Cuss Cr., LaFayette-Pontotoc	FC	11	20	35.20	8,964
Duncan-Cane Cr., Pontotoc	FC	6	16	7.89	2,298
Fair Cr., Chickasaw	FC	2	2	1.94	819
Little Spring-Ochewalla Cr., Marshall	FC	-	28	-	-
Locks Cr., Benton, Union	FC	4	15	9.88	2,766
Lower Tippah R., Benton, Marshall, Tippah	FC,R	12	56	95.54	44,399
Mill Cr., Marshall, Union	FC	4	16	4.51	1,204
N. Tippah Cr., Tippah	FC	4	8	3.93	978
Oaklimeter Cr., Union, Benton, Marshall	FC	12	21	11.63	3,280
Pigeon Roost Cr., Desota, Marshall	FC	3	29	2.88	752
Upper Skuna R., Calhoun, Chickasaw, Pontotoc	FC	0	32	-	-
Upper Tippah Cr., Benton, Tippah	FC	1	2	2.01	551
Hell Cr., Tippah, Union	FC	5	19	5.68	1,665
Wolf River Basin:					
Grays Cr., Benton	FC	10	18	13.31	4,500

Project & County	Purposes	Structures		Drainage Area Controlled (Sq. Mi.)	Total Storage (AF)
		FWR (No.)	Chan. (Mi.)		
Hatchie River Basin:					
Muddy Cr., Tippah	FC	28	38	49.11	16,576
Tuscumbia Cr., Alcorn, Prentiss	FC	22	131	98.41	40,701
West Hatchie Cr., Tippah	FC	8	40	25.38	7,133
Pearl River Basin:					
Tallahaga Cr., Choctaw, Winston	FC	11	51	43.76	17,728
Tombigbee-Warrior Basin:					
Houlka Cr., Chickasaw	FC,R	16	65	62.28	24,531
Chuquatonchee, Clay, Chickasaw, Pontoco	FC,FWL	22	59	86.35	31,208
Old Town Cr., Lee, Pontotoc, Prentiss, Union	FC,R	35	180	158.56	73,551
Chiwapa Cr., Lee, Pontotoc	FC,R	10	50	33.07	10,863
Brown Cr., Prentiss	FC	8	53	65.10	22,065

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *U.S. Department of Agriculture*

1. *Upstream Watershed Projects (For Acceleration)*

Upstream Watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Line Creek, Twenty-Mile, Donovan Creek, MacKay's Creek, Mantachie Creek, Reed Cummings, Bull Mountain Creek, Tallabinnela Creek, Cowpenna Creek, Mattubby & James Creek, Weaners & Stanefer Creek, Hang Kettle & Town Creek, McKinely's Creek, Trim Cane Creek, Spring & Town Creek, Stinson Creek, Lower Luxapalila Creek, Catalpa Creek, Cypress & Talking Warrior, McCowers Creek, Ellis, Nash & Kincade Creek, Browning & W. Water Creek, Bogue Chitto & Woodward Creek. These watersheds would cost an estimated \$46,072,000 and provide \$2,327,700 in estimated average annual benefits.

As part of the Comprehensive River Basin Study of the Big Black River Basin, five watersheds in Appalachia were recommended. They were Spring Creek, Little Black Creek, Big Bywy Ditch, Calabrella Creek, and Wolf Creek. Structural measures recommended in these watersheds include 25 floodwater retarding structures, 2 multiple-purpose structures for flood prevention and recreation, and approximately 150 miles of tributary channel improvement.

2. *Land Treatment Measures*

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u> <u>(\$000)</u>
Cropland	Acres	1,948,200	11,865
Grassland			
Plantings	Acres	48,130	963
Renovation	Acres	110,610	2,212
Critical Area Stabilization			
Roadbanks	Acres	8,630	3,021
Surface Mined Areas	Acres	—	—
Recreation and Wildlife Land			
Farm Ponds	No.	400	172
Pond Management	No.	3,000	194
Recreation Access Roads	Miles	75	1,381
Wildlife Habitat Development	Acres	28,340	2,040
Wildlife Habitat Preservation	Acres	356,410	713
Picnic Areas	Acres	450	697
Camping Areas	Acres	180	900
Recreation Planting Areas	Acres	200	40
Conservation Plans	No.	7,090	1,870
Soil Survey	Acres	1,429,920	420
Forest and Woodland			
Management Plans	No.	1,740	296
Tree Planting	Acres	50,000	1,213
Erosion Control	Acres	71,000	2,428
Harvest Cutting	Acres	62,000	236
Hydrologic Stand Improvement	Acres	164,000	2,364
Woodland Grazing Control	Acres	299,000	972
Total			33,997

3. Forest Service Accelerated Treatment Program

The accelerated land treatment measures in the Tombigbee and Holly Spring National Forests are:

<u>Measure</u>	<u>Amount</u> <u>(Acres)</u>	<u>Costs</u> <u>(\$000)</u>
Timber		
Tree Planting	20,950	1,241
Timber Stand Improvement	35,745	714
Soil and Water		
Gully Stabilization	26	13
Sheet Erosion Control	20	3
Streambank Stabilization	50	61
Stream Channel Clearing	59	6
Rehabilitated Abandoned Roads and Trails	1,340	67
Mined Area Stabilization	1	1
Soil Survey	188,500	57
Watershed Analysis	234,000	70
Fish and Wildlife	95,000	2,300
Total		4,533

4. *Forest Service Recreation Development*

The outdoor recreation development program for the Holly Springs National Forest will be met through accelerated funding of the Forest Service regular 10-year program.

(3) *Major Continuing Studies*

Continuation of current studies of the Tombigbee River Basin by USDA, Corps and others is recommended with an interim Corps report for local flood protection at Columbus and for a full basin report with emphasis on water quality control at Columbus and flood control in both upstream and downstream rural areas throughout the basin. Yellow Creek Reservoir site has been identified for continued planning. Local interests are to continue planning for rural and regional water distribution systems.

A study of the Hatchie River Basin is presently underway, with completion scheduled in FY 1971. As a part of the basin study, a reservoir site on the Hatchie River west of Corinth for flood control and recreation is being investigated, but the studies are not sufficiently advanced to reach any conclusions at this time. Flood damage reductions in Appalachia would be primarily rural; however, recreational development would benefit the projected growth in the Corinth area.

(4) *Future Studies*

After 1990, plan the remaining feasible watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

9. THE PLAN FOR APPALACHIAN NEW YORK

The 14-county New York area in the Appalachian Region lies in the drainage basins of the Delaware, Susquehanna, Genesee, Oswego, Allegheny and Hudson Rivers and of small tributaries flowing into Lake Erie. See Map 6, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
Susquehanna River Basin:				
Almond Reservoir	Op	FC,R	124	14,800
Arkport Reservoir	Op	FC	-	7,950
E. Sidney Reservoir	Op	FC,R	210	33,550
Whitney Point Res.	Op	FC,R	1,200	86,500
Ohio River Basin:				
Kinzua Dam (Allegheny Res.)	Op	FC,LF,R,P	12,080	940,000

(b) Navigation

A medium draft commercial harbor is in operation in Lake Erie at Dunkirk. The entrance channel depth is maintained at 16 feet. The harbor also has a breakwater 2,814 feet in length.

The small boat harbor on Lake Erie at Barcelona has an entrance channel depth of 10 feet and has two breakwaters, 693 feet and 790 feet long.

(c) Local Protection Projects

<u>Stream</u>	<u>City of County</u>	<u>Status</u>	<u>Type*</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Susquehanna River Basin:					
Canisteo Cr./ Tuscarara Cr.	Addison	Op	L	10,600	Urban
Cohocton R./ Salmon Cr.	Avoca	Op	L,CI	13,000	Urban
Newton Cr.	Bainbridge	Op	CI	2,335	Urban
Cohocton R.	Bath	Op	L	11,750	Urban
Otselic Cr.	Cincinnatus	Op	CI	5,280	Urban
Chenango R./ Susquehanna R.	Binghamton	Op	L,CI	35,300	Urban
Canisteo R./ Purdy & Bennett Cr.	Canisteo	Op	L,CI	16,400	Urban

* L = Levee; CI = Channel Improvement

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Susquehanna River Basin: (cont'd)					
Susquehanna R.	Conklin- Kirkwood	Op	CI	37,000	Urban
Chemung R./ Monkey Run	Corning	Op	CI	4,330	Urban
Tioughnioga R.	Cortland	Op	CI	14,200	Urban
Chemung R.	Elmira	Op	L	68,800	Urban
Susquehanna R.	Endicott, Johnson City & Vestal	Op	CI	42,200	Urban
Birdsall Cr.	Greene	Op	CI	1,200	Urban
Canisteo R.	Hornell	Op	CI	59,000	Urban
Tioughnioga R.	Lisle	Op	CI	5,120	Urban
Wappasening Cr./ Susquehanna R.	Nichols	AE&D	L	10,000	Urban
Chenango R.	Oxford	Op	CI	2,100	Urban
Cohocton R./ Chemung R./ Hodgman Cr.	Painted Post	Op	CI	8,700	Urban
Tioughnioga R.	Whitney Point Village	Op	CI	7,100	Urban
Martin Brook	Unadilla	UC	CI	3,117	Urban
Chenango R.	Sherburne	Op	CI	10,500	Urban
Chenango R.	Norwich	Op	CI	9,000	Urban
Chenango R.	Port Dickinson	Op	CI	1,200	Urban
Oswego Cr.	Oswego	Op	CI	9,000	Urban
Susquehanna R.	Oneonta	Op	CI	1,500	Urban
Allegheny River Basin:					
Allegheny R./ Dodge Cr.	Portville	Op	CI	24,840	Urban
Allegheny R./ Olean Cr.	Olean	Op	CI	43,000	Urban
Allegheny R.	Salamanca	AE&D	L	4,470	Urban
Genesee River Basin:					
Genesee R./ Dyke Cr.	Wellsville	Op	L,CI	15,500	Urban
Oswego River Basin:					
Catharine Cr./ Havana Glen Cr.	Montour Falls	Op	L,CI	6,800	Urban
Cayuga Inlet	Ithaca	UC	L,CI	17,000	Urban

* L = Levee; CI = Channel Improvement

(d) *Flood Plain Information Studies*

Flood plain information studies have been completed as follows:

Cattaraugus Creek - Mouth through Gowanda, and at Arcade
Cayuga Lake - Cayuga, Seneca, and Tompkins Counties
Seneca Lake - Ontario, Seneca, Schuyler, and Tompkins Counties
Allegheny River and Olean Creek - Olean
Allegheny River - Salamanca

Studies are in progress as follows:

Susquehanna River - Windsor and Colesville in Broome County
Chenango River - Fenton and Chenango in Broome County
Tioughnioga River - Barker, Lisle, and Triangle in Broome County
Allegheny River and Fivemile Creek - Allegany
Chadokoin River - Jamestown-Falconer

(2) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Susquehanna River Basin:					
Dean Cr., Tioga	Land treatment only				
Great Brook, Chenango	FC	1	0.3	1.93	216
Upper Five Mile Cr. Steuben and Yates	FC	-	0.1	-	-

(3) *Non-Federal Reservoirs (Major)*

<u>Project & County</u>	<u>Purpose</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
N.Y.C. Board of Water Supply:			
Pepacton Reservoir, Delaware	WS	6,400	453,880
Cannonsville Reservoir, Delaware	WS	5,376	280,000

B. RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES

(1) Early Action, Authorization not Required

(a) Corps of Engineers

1. Reservoirs

<u>Project</u>	<u>Purposes</u>	<u>Yield (cfs)</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
Charlotte Creek Complex	FC,WS,WQ,R	134	2,700	132,500
Davenport Center Reservoir	FC,WS,WQ,R	59	565	38,000
T-2 Reservoir				
South Plymouth Reservoir				

Formulation of the Charlotte Creek Complex (including the authorized Davenport Center Reservoir) will be reported in the Susquehanna Basin reports. It is proposed as a multiple-purpose project and would consist of two units. The lower unit would be constructed at the Davenport Center site; the upper unit (T-2 Reservoir) would be constructed immediately above the headwaters of the lower unit. The project would reduce flooding along Charlotte Creek and the Susquehanna River. It would also provide water supply storage and storage for water quality improvement. The recreation facilities would accommodate an annual visitation of 400,000 people.

Also as reported in the Susquehanna reports, the South Plymouth Reservoir, on Canasawacta Creek, would furnish flood protection, water supply, and recreation benefits, and will also be proposed for addition of water quality storage. Reduction of flooding would occur in the Chenango Valley Growth Complex at the City of Norwich. Water supply storage in the project would be for use of Norwich.

2. Navigation

Another small boat harbor has been authorized on Lake Erie at the mouth of Cattaraugus Creek. It will have a channel depth of 6 feet and a breakwater 2,300 feet in length.

3. Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Allegheny River Basin:				
Lake Chautauqua/ Chadakoin River*	Mayville & Jamestown	CI	17,000	Urban
Oswego River Basin:				
Cascadilla/Fall Creek*	Ithaca	L,CI	7,100	Urban

* See also notes under "Future Studies" at the end of this State Summary.

The Lake Chautauqua-Chadakoin River Project would provide a high degree of protection to the shores of Lake Chautauqua and to the community of Jamestown on the Chadakoin River. Jamestown is included in the Lake Chautauqua-Warren, Pennsylvania Growth Center.

The Cascadilla and Fall Creek Project would consist of both levees and channel improvement, and would provide flood protection in the City of Ithaca, a part of the Ithaca-Cortland Growth Center.

4. Flood Plain Information Studies

Flood plain information studies should be scheduled for early accomplishment at: Oneonta, Unadilla, Sidney, Conklin, Kirkwood, Endicott, Johnson City, Vestal, Oswego, Norwich, Oxford, Green, and Cortland.

(b) U.S. Department of Agriculture Upstream Watershed Projects

Project & County	Purposes	Structures		Drainage Area Controlled (Sq. Mi.)	Total Storage (AF)
		FWR (No.)	Chan. (Mi.)		
Susquehanna R. Basin:					
Genegantslet Creek, Chenango, Cortland & Broome	FC,R,FWL	2	5.0	6.70	1,759
L. Choconut, Finch Hollow, Trout Brook & Broome	S,FC	7	-	16.22	2,870
Nanticoke Creek, Broome	S,FC,FWL	11	5.6	40.04	7,362
Patterson, Brixius Grey Creek, Broome	S,FC	1	-	4.42	960
Marsh Ditch, Allegany, Steuben	FC	0	4.7	-	-
Newtown-Hoffman Creek, Chemung, Schuyler	FC,WS,R	7	3.3	38.7	9,903
Allegheny R. Basin:					
Conewango Creek, Chautauqua & Cattaraugus	S,FC, FWL,R	20	17.0	103.20	23,578
Ischua Creek, Cattaraugus	S,FC, FWL,R	8	-	43.84	9,481

(2) Early Action, Authorization or Acceleration of Programs and Project Studies Needed

(a) Corps of Engineers Reservoirs

Project	Purposes	Yield WQ (cfs)	Conservation Pool Area (Acres)	Total Capacity (AF)	Est. Costs (\$000)
Susquehanna River Basin:					
Mud Creek Reservoir	FC,R,WS,WQ	25	2,000	38,000	21,700
Five Mile Creek Reservoir	FC,R,WS,WQ	6.1	1,100	51,000	46,700
Site 49-28	FC,R,WQ	53	1,300	31,000	10,600
Genesee River Basin:					
Stannard	FC,WS,WQ, I,R,ED	95*	2,330	97,500	37,500

* Includes some water supply; storage allocations for WS and WQ to be determined during AE&D.

1. *Susquehanna River Basin Reservoirs* (Volume 3, Chapter 4, Part II)

a. Mud Creek, Five Mile Creek, and Site 49-28 Reservoirs are being studied as a part of the Susquehanna River Basin investigation. These projects are recommended as desirable elements of a plan of improvement for the Susquehanna River Basin and will be reported in detail in the Susquehanna Report. The Mud Creek and Five Mile Creek Reservoirs would be located on creeks of the same name, tributaries of the Cohocton River. They would provide flood reductions in the Corning-Elmira Growth Center, storage for water supply use of these cities, storage for water quality improvement along both the Cohocton and Chemung Rivers, and additional opportunities for both general recreation and fishing in the area.

b. The project listed as Site 49-28 Reservoir would be located on the West Branch Tioughnioga River about 15 miles upstream of Cortland. It would provide reductions to flooding at Cortland and storage for water quality improvement in this same reach of the stream. The project would supply 238,000 recreation days annually.

2. *Stannard Reservoir* (Volume 8, Chapter 10, Part III)

Stannard Reservoir would be located on the Genesee River about 4 miles south of Wellsville, in Allegany County. The flood reductions provided by the reservoir would increase the flood-free lands near Wellsville that are available for agricultural and other industrial purposes. The reservoir would also provide storage for irrigation, water supply and water quality improvement. Although water quality is not now a problem, the more intense agricultural use of the flood plain, and water-using industries that are expected to locate there will probably create a problem. Cost sharing pertaining to water quality improvement would be developed during the advanced engineering and design studies since the beneficiaries cannot be identified at present. The reservoir would also provide recreation facilities, at and below the reservoir, that would accommodate an annual visitation of 233,000. Annual project charges are estimated to be 2,150,000 dollars and annual benefits are estimated to be 2,591,000 dollars. Annual Economic Development developmental costs and benefits would be 960,000 and 4,322,000 dollars. At time of writing, a public hearing on this project had not been held, but was being scheduled.

3. *Navigation*

Small boat harbor studies should be continued to develop mooring and refuge facilities on Lake Erie at Lake Erie State Park and at Dunkirk.

4. *Local Protection Projects*

Local flood protection projects, in the early action category, which require further study are:

Cattaraugus Creek at Gowanda
West Branch, Delaware River at Delhi
Tioughnioga River at Marathon
Allegheny River at Allegany

5. *Flood Plain Information Studies*

Flood plain information studies should be scheduled for early accomplishment at: Oneonta, Unadilla, Sidney, Conklin, Kirkwood, Endicott, Johnson City, Vestal, Owego, Norwich, Oxford, Greene, Cortland, Big Flats, Welton and Delhi.

(b) *U.S. Department of Agriculture*

1. *Watershed Projects (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>			
Cayuga Inlet, Schuyler	FC	7	0	77.6	14,510	2,080
Mill Brook, Chenango	FC,R	2	0	3.5	930	415
Great Valley, Cattaraugus	FC	6	0.5	71.5	10,980	2,791
Little Valley, Cattaraugus	FC,R	2	0	4.2	1,450	552

Mill Brook Watershed Project would be an important development on Unadilla Creek above Sidney and Binghamton Growth Centers. Cayuga Inlet Watershed Project is needed to provide Ithaca with additional protection from local flooding. Great Valley and Little Valley Watershed Projects form important elements of the Allegheny Basin Plan above the Allegheny Reservoir.

2. *Upstream Watershed Projects (For Acceleration)*

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Lake Otsego Tributary, Still Creek, Little Snake Creek, Smith Brook, Thomas Creek, Chenango Creek, Shapley Branch, Crocker Creek, Michigan Creek, Mill Creek, and Bear Swamp Pond. These are eleven of the over 80 watersheds selected as needing project action in the 1967 Conservation Needs Inventory for Watersheds. Project data will be developed as work schedule (funds) permit.

3. *Land Treatment Measures*

U.S. Department of Agriculture's recommendations include the accelerated land treatment measures for a 10-year period, as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	203,520	7,101
Grassland			
Plantings	Acres	33,140	243
Renovation	Acres	89,970	660
Critical Area Stabilization			
Roadbanks	Acres	4,890	1,712
Surface Mined Areas	Acres	—	—
Recreation and Wildlife Land			
Farm Ponds	No.	841	361
Pond Management	No.	130	8
Recreation Access Roads	Miles	79	1,440
Wildlife Habitat Development	Acres	8,550	616
Wildlife Habitat Preservation	Acres	7,330	15

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u> <u>(\$000)</u>
Recreation and Wildlife Land (cont'd)			
Picnic Areas	Acres	390	605
Camping Areas	Acres	150	751
Recreation Area Planting	Acres	180	36
Conservation Plans	No.	10,180	2,910
Soil Survey	Acres	3,198,220	1,250
Total			17,708

4. *Forest Service Accelerated Treatment Program*

The Forest Service accelerated treatment program includes the following measures:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u> <u>(\$000)</u>
Forest and Woodland			
Management Plans	No.	2,400	420
Tree Planting	Acres	75,000	3,300
Erosion Control	Acres	260	5
Harvest Cutting	Acres	31,000	248
Hydrologic Stand Improvement	Acres	28,000	1,204
Woodland Grazing Control	Acres	43,000	106
Total			5,283

5. *Forest Service Recreation Development*

The 10-year recreation development plan of the Forest Service is directed toward development of the Hector Land Use Area in northern Schuyler County, and in Yates and Seneca Counties.

The Hector Land Use Area lies in the center of the Finger Lakes Region in northern Schuyler County, in Appalachia, and in Yates and Seneca Counties. The Forest Service owns 13,258 acres. The plan calls for purchase of 13,000 acres of additional lands. The 10-year accelerated recreation plan includes six recreation sites (36 acres) and 40 acres of surface water in four lakes. The cost would be about \$289,000, and the proposal is under study by the State.

(3) *Major Continuing Studies*

Major studies now in progress are: Comprehensive Interagency Studies of the Susquehanna River and the Genesee River Basins; the Comprehensive Framework Interagency Study of the North Atlantic Region; and the Northeastern Water Supply Study.

(4) *Future Studies*

Tributaries of the Allegheny River should be studied, under an Allegheny River Basin Study, to determine whether improvements to provide flood control, low flow augmentation, water supply, recreation, and fish and wildlife conservation are needed on Cassadaga, Conewango, and Stillwater Creeks.

Cattaraugus Creek watershed should be studied to determine the desirability of improvements to provide flood control, low flow augmentation, irrigation, recreation, and power. To be included among alternatives are damsites designated as Zoar, Otto, and Springville. The local "Regional Board" has selected Otto for early action, and Springville as a later addition.

A project feasibility study of multi-purpose reservoirs in Fall and Six Mile Creeks should be made to determine the best alternative for meeting water resource needs of the Ithaca-Cortland area.

The study of Chautauqua Lake and the Chadakoin River should be completed to determine the best way of stabilizing the lake levels for recreation, flood control, water quality management, and possibly power. The studies by USDA of possible alternatives should be incorporated.

An upstream watershed investigation should be made for the West Branch of Delaware River to provide flood reductions, water supply, and recreation.

The above studies should be rescheduled to be completed by 1980.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

10. THE PLAN FOR APPALACHIAN NORTH CAROLINA

The Appalachian portion of North Carolina contains 29 counties located in the Blue Ridge and Piedmont physiographic regions, drained by the Kanawha, Yadkin, Santee and Tennessee River systems. See Map 7, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoir

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Yadkin-Pee Dee R. Basin W. Kerr Scott Res.	Op	FC,WS	1,470	153,000	-

(b) Flood Plain Information Studies

Flood plain information studies have been completed for Winston-Salem, Elkin and Morganton.

(2) Tennessee Valley Authority

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Tennessee R. Basin					
Fontana	Op	FC,P,N	8,900	1,448,000	202
Hiwasse	Op	FC,P,N	5,500	434,000	117
Chatuge	Op	FC,P,N	5,300	240,500	10
Apalachia	Op	P	1,050	57,500	75

(b) Flood Plain Information Studies

Flood plain information studies have been completed at Andrews, Asheville, Black Mountain, Brevard, Bryson City, Canton, Cherokee, Clyde, Franklin, Hendersonville, Hot Springs, Maggie, Marshall, Montreat, Murphy, Robbinsville, Spruce Pine, Swannanoa, and Sylva. Studies are in progress for Hazelwood and Waynesville.

(3) *Non-Federal Reservoirs (Major)*

(a) *Alcoa*

<u>Project</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Santeetlah	P	2,300	153,600	45
Cheoah	P	600	35,000	110
Bear Creek	P	450	34,700	9
Thorpe	P	1,200	71,100	21
Nantahala	P	1,300	137,300	43

(b) *Carolina Power & Light Co.*

<u>Project</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Walters	P	340	25,300	108

(c) *Duke Power Co.*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
James	P	6,510	300,000	25
Rhodhiss	P	3,515	39,000	25
Hickory	P	4,110	127,500	45
Lookout Shoals	P	1,270	40,000	23

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Reddies R. Res.	FC	720	60,500	-

2. *Flood Plain Information Studies*

Flood plain information studies are recommended in the following communities of Appalachian North Carolina:

Wilkesboro	Rutherfordton
N. Wilkesboro	Spindale
Mt. Airy	Forest City
Lenoir	

(b) *Tennessee Valley Authority*

1. *Upper French Broad River Project*

The plan recommended by TVA (Volume II, Chapter 17, Part III) consists of a system of dams, 58 miles of channel enlargement, 16 miles of selective bank clearing along the channel, and a levee along 1.4 miles of the Asheville waterfront. The project would provide benefits resulting from protecting some 13,000 acres of agricultural lands and provide urban flood relief to nine communities, and 24,500 acre-feet of storage for water supply for Asheville, Hendersonville, and several potential industrial sites. Ten of the reservoirs would have 76,900 acre-feet of storage reserved for water quality control releases that would increase the low flow of the French Broad River at mile 190.6 to 315 cubic feet per second and the dissolved oxygen level to a minimum of 4 milligrams per liter. In addition to the above benefits, thirteen of the reservoirs would contain a total of 6,755 acres at normal pool and 183 miles of shorelines that would provide new opportunities for recreation, shoreline development, and fishing.

The project would provide benefits resulting from agricultural and urban flood relief, water supply, water quality control, recreation, shoreline development, fish and wildlife, and area development. The annual national account benefits for the project are \$8,709,000, and the estimated cost of construction of the project is \$100 million. Regional economic expansion resulting from the project is estimated at \$15,400,000 annually.

As a complement to the project planning studies made by TVA, the North Carolina State Planning Task Force, with TVA encouragement and assistance, undertook an investigation of the degree to which the proposed water control system would enhance the land uses of the area. Particular attention was given to the reservoirs and how they would affect the activities that are presently occurring and those that are most likely to occur in the future. These investigations also resulted in an appraisal of the kinds and amounts of public and private investment that can be expected to be associated with the water control system. Although conditioned upon the continuation of the present strong organizational arrangements and an active developmental and promotional effort throughout and beyond the construction period, the magnitude of these investments is expected to exceed substantially \$150 million.

2. *Flood Plain Information Studies*

Flood plain information studies are recommended for Cullowhee and Rosman.

(c) *U.S. Department of Agriculture Upstream Watershed Projects*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Deep Creek Yadkin	FC	17	39.7	47.11	9,522
Dutchman Creek Yadkin, Davie, Iredell	FC,R	9	38.7	54.90	11,519
Little Yadkin River Forsyth, Stokes, Surry	FC	3	31.0	13.69	4,275
Mud Creek 1/ Henderson	FC	17	27.8	57.42	11,781
Muddy Creek Burke, McDowell	FC	9	23.4	36.00	5,686
Stewarts Cr.-Lovill Cr. Carroll (Va), Surry	FC,WS	4	11.0	60.08	15,171
Town Fork Creek Forsyth, Stokes	FC	13	21.2	81.04	22,451
Abbott Creek Davidson, Forsyth, Guilford, Randolph	FC	14	49.7	29.93	11,781

1/ Inactive, superseded by Upper French Broad River project.

(d) *Non-Federal*

1. *Duke Power Company*

<u>Project & Location</u>	<u>Status</u>	<u>Purposes</u>	<u>Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost* (\$000)</u>
Belew's Pond, Trib. of Dan River	Comp by 1974	Cooling Pond R,FWL	4,160	190,000	13,500

* Total project cost with 2,288 megawatt thermal electric installation is \$269,347,000.

2. *City of Statesville acting for itself and other municipally-owned utilities and North Carolina Electric Membership Corp.*

<u>Location</u>	<u>Status</u>	<u>Purpose</u>	<u>Elevation</u>		<u>Installed Capacity (Megawatts)</u>	
			<u>L. Pool</u>	<u>U. Pool</u>	<u>Initial</u>	<u>Ultimate</u>
Mile 29 of Green River	Appli- cation*	Pumped Storage Hydropower	1100'	2100'	500	2,000

* To Federal Power Commission for preliminary license to complete study.

3. *Appalachian Power Company*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Blue Ridge (Upper) Res.	*	P,WQ	26,000	2,010,000	1,600
Blue Ridge (Lower) Res.	*	P,FC,WQ	14,400	1,251,000	200

* Appalachian Power Company revision of authorized Moores Ferry Res. (CE) under consideration for license by Federal Power Commission; both damsites and much of the reservoir pools are located in Virginia.

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers*

1. *Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Yields</u>		<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
		<u>WS mgd</u>	<u>WQ cfs</u>			
Roaring R.	FC,WS,WQ FWL,R,ED	16	120	500	77,300	10,758
Clinchfield	FC,WS,WQ R,FWL,ED	443	1,330*	20,220	1,036,000	58,565

* Gross flow, seasonally adjusted, below Pacolet River.

a. *Roaring River Reservoir* (Volume 7, Chapter 6, Part III)

Roaring River Reservoir would be located in Wilkes County. The project would control drainage of 129 square miles of the Roaring River tributary of the Yadkin River and provide storage of 77,300 acre-feet. Developmental impacts from the project are expected from flood protection to Elkin-Jonesville, allowing additional development for urban uses; from additional water supply for the Winston-Salem area; and from additional employment opportunities related to expenditures of recreational visitors to the project. Of the total, 48,200 AF would be for flood control, 5,160 AF for water supply, 18,000 AF for water quality control, and 5,940 AF for sediment reserve. The annual costs and benefits would be \$649,000 and \$663,000. The economic development costs and benefits are estimated to be \$916,000 and \$5,217,000, from about 9,870 new jobs.

b. *Clinchfield Reservoir* (Volume 7, Chapter 5, Part III)

Clinchfield Reservoir would be located in Rutherford and Polk Counties. The reservoir would drain 571 square miles of the Broad River Basin. It is planned to meet water supply needs in the surrounding counties of North and South Carolina. The major developmental impacts of the project are expected to come from provision of additional water supply to a fast growing multi-county area in both North and South Carolina, and from the expenditures locally of about 6,000,000 annual visitors anticipated at the project. Flood control storage would be 206,000 AF; water supply storage would be 716,000 AF; storage for water quality control would be 90,000 AF. The project would cost \$58,565,000; annual costs and benefits would be \$2,856,000 and \$4,865,000. The economic development program annual cost would be an estimated \$11,207,000 and would yield benefits of \$94,650,000, from over 49,000 new jobs.

(b) *U.S. Department of Agriculture*

1. *Upstream Watershed Projects (For Acceleration)*

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Turner Creek, Hunting Bear Creek, Upper South Yadkin River, Cane Creek, Tallulah Creek and Second Broad River (which includes Camp-Cane watershed). These watersheds could provide 51,500 acre feet of storage for flood prevention; 3,000 acre feet for recreation; 1,700 acre feet for municipal and industrial water supply at an estimated first cost of \$3,906,000. Average annual benefits for these projects would total an estimated \$365,400.

2. *Land Treatment Measures*

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	4,130	141
Grassland			
Plantings	Acres	72,390	539
Renovation	Acres	52,170	389
Critical Area Stabilization			
Roadbanks	Acres	4,770	1,670
Recreation and Wildlife Land			
Farm Ponds	No.	129	52
Pond Management	No.	1,520	99
Recreation Access Roads	Miles	12	215
Wildlife Habitat Development	Acres	3,800	274
Wildlife Habitat Preservation	Acres	970	2
Picnic Areas	Acres	2,000	3,100
Camping Areas	Acres	800	4,094
Recreation Area Planting	Acres	910	182
Conservation Plans	No.	2,360	610
Soil Survey	Acres	70,910	30
Forest and Woodland			
Management Plans	No.	1,130	192
Tree Planting	Acres	115,800	2,976
Erosion Control	Acres	19,000	718
Harvest Cutting	Acres	127,200	452
Hydrologic Stand Improvement	Acres	121,400	1,939
Woodland Grazing Control	Acres	97,700	317
Total			17,991

3. *Forest Service Accelerated Treatment Program*

The accelerated land treatment measures on Pisgah and Nantahala National Forest lands are as follows:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	100,840	6,050
Timber Stand Improvement	145,290	2,805
Soil and Water		
Gully Stabilization	660	329
Sheet Erosion Control	3,340	501
Streambank Stabilization	20	26
Streambank Channel Clearing	2,850	284
Rehabilitated Abandoned Roads and Trails	7,200	356
Mined Area Stabilization	80	85
Soil Survey	892,840	266
Watershed Analysis	790,840	236
Fish and Wildlife	279,700	628
Total		11,566

4. *Forest Service Recreation Development*

Excellent access to the Nantahala and Pisgah National Forests will be available after the completion of Interstate Highways 40 and 81 and Appalachian Highways A, B, and K.

Pisgah Forest Recreation Area will provide for 15,000 people at one time and an estimated annual visitor-day use of 6,000,000 by 1980. Estimated first costs are \$27,800,000.

Back Creek Lake is proposed in Pisgah National Forest, a 20 to 50-acre lake with facilities to accommodate up to 2,000 people at one time. Estimated first costs are \$1,250,000.

(3) *Major Continuing Studies*

Current basin studies of the Yadkin-Pee Dee, the Santee River System, and the Kanawha-New River Basin are underway. All studies are oriented towards development of the rivers to meet identified needs in and outside of Appalachia. Participation by USDA in the Santee River Basin Study should be continued until the plan is complete.

Investigations are in progress in both the Pigeon River and upper Little Tennessee River Basins in conjunction with other developmental planning in the areas. The Pigeon River investigation is directed toward solution of local flooding problems at Canton and several other communities, reduction of the industrial waste problem at Canton, provision of an improved industrial water supply, and recreation development.

Present investigations in the upper Little Tennessee River Basin are confined to the portion of the Little Tennessee River above Franklin and the Tuckasegee River above the headwaters of Fontana Reservoir near Bryson City. These investigations are being directed toward reduction of the urban flood problems at Franklin, Sylva, Bryson City, Cherokee and nearby communities, agricultural

flood damage reduction, alleviation of the industrial waste problem, enhancement of industrial sites through flood control and provision of industrial water supply, and provision of water-based recreation facilities.

(4) *Future Studies*

A future study of water conveyance facilities to distribute water from the Clinchfield Reservoir to various points of use, to be made in conjunction with studies of water quality management and flood control in the Upper Saluda Basin, is recommended.

Studies of development of the Yadkin River with particular emphasis on the section of the river upstream from Winston-Salem to meet potential water supply, recreation, cooling water and power needs across the Greensboro - High Point - Winston-Salem complex is recommended.

A reconnaissance study of potential flooding at Morganton, North Carolina should be undertaken to define the seriousness of the flooding hazard resulting from operation of upstream power projects during severe floods.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

11. THE PLAN FOR APPALACHIAN OHIO

The 28 Ohio counties in Appalachia lie along the Ohio River. See Map 8, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
Muskingum Basin:				
Atwood*	Op	FC,R	1,540	49,700
Beach City*	Op	FC,R	420	71,700
Bolivar*	Op	FC	0	149,600
Clendening*	Op	FC,R	1,800	54,000
Dillon	Op	FC,R	1,560	274,000
Dover*	Op	FC	350	203,000
Leesville*	Op	FC,R	1,000	37,400
Mohawk*	Op	FC	0	285,000
Piedmont*	Op	FC,R	2,310	66,700
Senecaville*	Op	FC,R	3,550	88,500
Tappan*	Op	FC,R	2,350	61,600
Wills Creek*	Op	FC,R	900	196,000

Recreation facilities operated and maintained by Muskingum Watershed Conservancy District.

Hocking Basin:

Tom Jenkins (Burr Oak)	Op	FC,WS,R	664	26,900
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Scioto Basin:

Paint Creek	UC	FC,WS,WQ,R	1,190	145,000
Salt Creek	AE&D	FC,R	1,233	100,300

Little Miami Basin:

East Fork Cr.	UC	FC,WQ,R	2,160	294,800
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* Included in original Muskingum River Basin Reservoir System.

(b) Navigation

The Ohio River Navigation System is being modernized to include facilities for increasing traffic and 1200-ft. tows. Nine of the locks and dams, along the Ohio border, are Meldahl, Greenup, Gallipolis, Racine, Belleville, Willow Island, Hannibal, Pike Island and New Cumberland.

An obsolete system of ten locks and dams on the Muskingum was built by the Corps, and is now operated by Ohio. It permits navigation above Zanesville, but is used essentially for recreation boating.

(c) *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Muskingum Basin: Moxahala Cr.	Roseville	Op	Channel & Levee	12,670	Urban
Hocking Basin: Hocking River	Athens	UC	Channel	26,400	Urban
Ohio River Mainstem: Ohio River	Ironton	Op	Levee	39,900	Urban
Scioto, Ohio River	Portsmouth	Op	Levee	42,770	Urban

(d) *Flood Plain Information Studies*

A flood plain information study has been completed at Chillicothe.

(2) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Upper Hocking, Hocking	FC,R	8	-	30.0	-
Clear Cr., Highland	FC	0	-	-	-

(b) *Flood Plain Information Studies*

Studies at Cambridge are complete.

(3) *U.S. Geological Survey Flood Plain Information Studies*

Studies are complete at Chillicothe, Amesville, Jackson, and Zanesville.

(4) *Non-Federal Reservoirs*

<u>Project & County</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
State of Ohio:				
Grant Lake, Brown	Op	R	221	1,190
Rocky Fork Lake, Highland	Op	R	2,020	34,100
Lake White, Pike	Op	R	337	3,734
Jackson Lake, Jackson	Op	R	243	1,700
Tycoon Lake, Gallia	Op	R	204	2,000
Lake Logan, Hocking	Op	R	340	3,000
Buckeye Lake, Perry	Op	R	2,853	19,940
Salt Fork, Guernsey	UC	FC,WS,R	3,000	71,500
Wolf Run, Noble	Op	FC,WS,R	220	2,000
Lake Mohawk, Carroll	Op	R	500	5,000+

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield</u>		<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
			<u>WQ (cfs)</u>	<u>WS (mgd)</u>		
Logan	FC,R,WQ, WS,ED	1,825	15	24	78,000	44,141

Logan Reservoir (Volume 10, Chapter 15, Part III)

The Logan Reservoir, which would be on Clear Creek, a tributary of the Hocking River, would store a total of 78,000 acre-feet of water. Water supply storage would be 29,900 acre-feet; 7,200 acre-feet would be stored for water quality control and recreation, 35,900 acre-feet for flood control and 5,000 acre-feet for sediment reserve. The reservoir would form a flood control system with local protection projects at Logan, Rockbridge, Nelsonville and Athens. Annual costs and benefits for the project studied in detail are estimated to be \$2,972,000 and \$3,052,000, respectively. Annual developmental costs and benefits would be \$5,070,000 and \$9,818,000; an estimated 4,470 new jobs would result from the project. Location of the dam will be specifically determined during preconstruction planning. Any plan would include a nature area, in public ownership.

2. *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Hocking Basin: Hocking River	Rockbridge	Snagging & Clearing	Not final	Urban
Scioto Basin: Scioto River	Chillicothe	Levee & Wall	Not final	Urban

3. *Flood Plain Information Studies*

Reports are programmed for Athens, Logan and Nelsonville in the Hocking River Basin; Cambridge, Coshocton, New Philadelphia-Dover, Uhrichsville-Dennison and Zanesville in the Muskingum River Basin; and for the entire main stem of the Ohio River.

(b) *U.S. Department of Agriculture Upstream Watershed Projects*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Area Controlled (Sq. Mi.)</u>	
Margaret Cr., Athens	FC,WS,R	6	9.8	19.4	5,300
Rush Cr., Hocking	FC,WS,R	23	22.1	96.4	18,200
W. Fork Duck Cr., Noble	FC,WS,R	8	19.9	40.0	16,400
Buffalo Cr., Guernsey	FC,WS	3	8.7	18.7	3,760

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield</u>		<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
			<u>WQ (cfs)</u>	<u>WS (mgd)</u>		
Whiteoak	FC,WQ,R, FWL,WS,ED	931	14.3	16.5	78,200	40,031

Whiteoak Reservoir (Volume 10, Chapter 14, Part III)

Whiteoak Reservoir would be on Whiteoak Creek in Brown County and 30 miles from Cincinnati SMSA. It will contain 12,450 acre-feet for water supply, 6,150 acre-feet of water quality storage, 9,500 acre-feet for sediment reservoir, 6,400 acre-feet for recreation, fish and wildlife, and 43,700 acre-feet for flood control. A migratory bird refuge is included within the Whiteoak Reservoir plan. Annual project costs and benefits are estimated to be \$2,573,000 and \$2,448,000, respectively. Annual developmental costs and benefits are estimated to be \$15,198,000 and \$89,005,000, representing about 14,600 new jobs.

2. *Local Protection Projects*

Local Protection Projects on the Hocking River are under study at Nelsonville and Logan (Hocking County); the projects will form a basin unit with similar projects at Rockbridge and Athens and the Logan Reservoir. A study of a local protection project at Lucasville (Scioto County) to protect Ohio's "Project Scioto" developmental areas should be continued.

(b) *U.S. Department of Agriculture*

1. *Upstream Watershed Projects (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>			
*Federal						
Valley Cr., Athens	FC,WS,R	11	14.0	52.6	16,130	3,190
*L. Salt Cr., Jackson	FC,R	13	14.6	47.8	14,680	3,270
Upper Whiteoak Cr., Brown	FC,R	6	0	72.1	20,560	2,780
Sugar Cr., Tuscarawas	FC,R	10	1.0	25.0	20,000	2,500
Sunday Cr., Athens	FC,WS,R	15	0	80.0	35,000	4,900
Miller Run, Scioto	FC,R	2	1.5	4.0	7,000	1,000

* Has economic development and expansion as a primary purpose - to be specially authorized.

Federal Valley Creek is a 145 square mile tributary of the Hocking River. A program is being developed to detain floodwaters from 36 percent of the drainage area in floodwater retarding structures. Plans are to store 200 AF of municipal and industrial water for the Athens area and 4,940 AF of water for recreation. Another 14,500 AF of water could be stored if necessary.

Little Salt Creek is a tributary of Salt Creek (Scioto Basin) which drains 139 square miles of Jackson, Pike, and Ross Counties. A program is being planned which would include storage of 3,190 AF of recreation water; 7,300 AF of storage is available for other beneficial uses. It is recommended that future storage be provided to supply 7 mgd to Jackson.

Upper Whiteoak Creek Watershed (234.3 sq. mi.) is being planned as an element, along with Whiteoak Reservoir, of the Whiteoak Creek developmental program (Clermont-Brown County Growth Area). There is a need to increase storage in some reservoirs to provide future water supply.

A Sugar Creek project below Beach City Reservoir (Muskingum Basin) is needed to protect the New Philadelphia Growth Center from local floods. Sunday Creek watershed program would complete the Hocking River Basin water resource development program by providing additional flood protection and water supply for the Athens Growth Center. A Miller Run Upstream Watershed program would be an important element in the "Project Scioto" - Lucasville (part of Portsmouth Growth Center) developmental plan.

2. *Upstream Watershed Projects (For Acceleration)*

Upstream watershed projects which should be planned and installed under acceleration of going programs before 1990 are: Moxahala-Jonathan Creek, Wakatomika Creek, O'Bannon Creek, Wolf Creek, Little Scioto River, Pine Creek, Short Creek and Leading Creek. The first seven of these watersheds could provide 109,000 acre feet of storage for flood prevention; 60,700 acre feet for recreation; and 1,800 acre feet for municipal and industrial water supply at an estimated first cost of \$23,320,000. Average annual benefits for these projects would total an estimated \$1,929,000. (Leading Creek data are not available.)

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period, as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	101,210	4,195
Grassland			
Plantings	Acres	7,350	89
Renovation	Acres	33,720	405
Critical Area Stabilization			
Roadbanks	Acres	5,550	1,943
Surface Mined Areas	Acres	17,970	1,348
Recreation and Wildlife Land			
Farm Ponds	No.	63	26
Pond Management	No.	1,010	65
Recreation Access Roads	Miles	6	114
Wildlife Habitat Development	Acres	3,050	220
Wildlife Habitat Preservation	Acres	8,660	17
Picnic Areas	Acres	260	402
Camping Areas	Acres	100	499
Recreation Area Planting	Acres	120	24
Conservation Plans	No.	1,250	230
Soil Survey	Acres	646,100	380
Forest and Woodland			
Management Plans	No.	700	127
Tree Planting	Acres	10,000	560
Erosion Control	Acres	-	-
Harvest Cutting	Acres	10,000	110
Hydrologic Stand Improvement	Acres	17,500	403
Woodland Grazing Control	Acres	12,500	36
Total			11,193

4. Forest Service Accelerated Treatment Program

The accelerated land treatment measures on 114,000 acres in the Wayne National Forest are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	890	55
Timber Stand Improvement	6,520	132
Soil and Water		
Gully Stabilization	4	3
Sheet Erosion Control	4	0.4
Streambank Stabilization	480	24
Stream Channel Clearing	71	37
Rehabilitated Abandoned Roads and Trails	36	6
Mined Area Stabilization	127	64

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Soil Survey	200,000	20
Watershed Analysis	150,000	20
Fish and Wildlife	358,400	2,445
Total		2,806.4

5. *Forest Service Recreation Development*

Excellent access to the Wayne National Forest, which lies in Southeast Ohio, will be possible by the completion of Interstate 77 and Appalachian Corridors C, B, and D.

The Forest Service has a recreation development program of \$8,573,000 for the forest. The program includes cost sharing with the Soil Conservation Service on Buckhorn Lake (628 acres) in Pine Creek Watershed. The Forest Service also plans recreation developments in the Sunday Creek Watershed and at the potential Monday Creek (CE) Reservoir. Other developments, totalling 810 acres of water surface, are planned at 12 locations within the forest.

(3) *Major Continuing Studies*

(a) *Corps of Engineers Reservoirs*

<u>Project</u>	<u>Purpose</u>	<u>Needed Storage (AF)</u>	<u>Estimated Costs (\$000)</u>
CE Muskingum Res. "A"	FC,WS,R	60,000	12,000
CE Muskingum Res. "B"	FC,WS,R	30,000	6,000
CE Muskingum Res. "C"	FC,WQ,R	70,000	25,000
Monday Creek Res.	FC,WS,R	30,000	7,500
Symmes Creek Res.	FC,WQ,R	50,000	20,000
Ohio Brush Creek Res.	FC,R	240,000	24,000

The Muskingum Reservoirs "A" and "B" are needed to provide flood control, water supply and recreation for the Zanesville and Cambridge Growth Centers. Reservoir "A" would be a new Frazeyburg Reservoir (authorized), or substitution. Reservoir "B" might be on Leatherwood Creek, or another Wills Creek tributary. Reservoir "C" would be on Killbuck Creek, or tributaries, as a revised Millersburg Reservoir (authorized) or substitution.

Monday Creek reservoir is needed for flood control, recreation and water supply (critical future need) in the Athens Growth Center. The Symmes Creek Reservoir is needed, principally, for stream quality control (mine drainage) and flood control. Ohio Brush Creek offers an excellent opportunity for Ohio River mainstem flood control and much needed major recreation developments.

(b) *Other Major Studies*

A high priority continuing study project is the Hocking Hills National Recreation Area proposed by the U.S. Department of Interior's Bureau of Recreation. The NRA would relate to the proposed Logan Reservoir.

The Muskingum River Basin Study being conducted by USDA, USDI, the Corps and other interested State (Ohio) and Federal agencies, will be complete in 1972.

(4) *Future Studies*

The "Southern Ohio Basins" Study should be started in 1971.

An Upper Ohio River Basin Study should be started as soon as programming permits (See comments in Pennsylvania).

Studies of the effectiveness of the system of flood control reservoirs throughout the Ohio River Basin should be continued after completion of the flood plain information studies along the main stem. These studies should have as goals determination of flood hazard stages at individual developmental sites, and determination of the overall expansion benefits from adding additional flood control storage to the system.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

12. THE PLAN FOR APPALACHIAN PENNSYLVANIA

The Appalachian portion of Pennsylvania includes fifty-two counties. The area lies in the Ohio, Potomac, Susquehanna, Genesee and Delaware River Basins. The principal rivers in the Ohio Basin are the Monongahela and Allegheny. See Map 9, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Allegheny R. Basin:					
Union City Res.	UC	FC,R	580	47,500	-
Woodcock Cr. Res.	UC	FC,LF,R	325	20,000	-
*Allegheny Res.	Op	FC,LF,R,P	12,080	1,180,000	330
Tionesta Res.	Op	FC,R	480	133,400	-
Crooked Cr. Res.	Op	FC	350	93,900	-
E.Br. Clarion Res.	Op	FC,LF,R	1,160	84,300	-
Mahoning Cr. Res.	Op	FC	170	74,200	-
Conemaugh Res.	Op	FC	300	74,000	-
Loyalhanna Res.	Op	FC	210	95,300	-
Beaver R. Basin:					
Shenango	Op	FC,LF,R	3,560	192,400	-
Delaware R. Basin:					
General Edwin					
Jadwin	Op	FC	-	24,500	-
Francis E. Walter	Op	FC	90	108,000	-
Prompton Res.	Op	FC	280	20,300	-
Beltzville Res.	UC	FC,WS,R	950	66,860	-
*Tocks Island Res.	AE&D	FC,WS,P,R	12,425	916,000	13.46
Ohio R. Basin:					
*Youghiogheny Res.	Op	FC,LF,R	2,840	254,000	-
Susquehanna R. Basin:					
Kettle Cr. Res.	Op	FC,R	160	75,000	-
Stillwater Res.	Op	FC,WS	83	12,000	-
*Raystown Res.	UC	FC,R,LF,FWL	8,300	762,000	-
Cowanesque Res.	AE&D	FC,R	410	95,700	-
*Tioga Hammond Res.	AE&D	FC,R	1,210	125,000	-
Foster Joseph					
Sayer Res.	UC	FC,R	1,730	99,000	-
Curwinstown Res.	Op	FC,LF,R	790	124,000	-
Aylesworth Res.	Op	FC,R	7	1,700	-

* Reservoirs marked (*) will make contributions to the several terminal recreation and vacation complexes being studied by the Appalachian Regional Commission in the Highlands Recreation Study. (See Chapter 2).

Acceleration of construction is needed for Tocks Island Dam and Reservoir, which will be located on the Delaware River about five miles upstream of the Delaware Water Gap. The dam will create a lake some 35 miles long on the northeastern boundary of the Appalachian Region, which will be surrounded by the Delaware Water Gap National Recreation Area, under the administration of the National Park Service. The combined project will require the eventual acquisition of almost 62,400 acres, of which 47,700 are for the recreation area and 14,700 are for the dam and reservoir. Of the total acreage to be acquired, almost half is located in Monroe and Pike Counties, in the Appalachian portion of Pennsylvania.

Acceleration is also needed for the construction of the Cowanesque and Tioga Hammond Reservoirs to enhance growth prospects at Corning and Elmira, New York. Acceleration of the Raystown Reservoir is also needed for its impact on Huntingdon County, Pennsylvania.

(b) *Navigation*

The navigation project for the Allegheny River includes eight navigation locks and dams along the 72 miles from Pittsburgh to East Brady.

The Monongahela navigation project includes six locks and dams in Pennsylvania. Improvements to the system includes one new project (Maxwell Lock and Dam) in Pennsylvania.

Forty miles of the Ohio River, below Pittsburgh, have been made navigable in Pennsylvania. The Ohio River is navigable throughout its length.

Erie Harbor, formed by the Presque Isle peninsula, located on the south lake shore, has a channel 29 feet deep to the bay and 18 to 28 feet in the bay, and a shore improvement.

A beach erosion control project along the lakeward shore of Presque Isle was completed in 1956. Pennsylvania modified the beach in 1966. Additional beach nourishment occurred in 1961, 1965, and 1969.

(c) *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Allegheny Basin:					
Tunungwant Cr.	Bradford	Op	Channel	36,170	Urban
Clarion R.	Johnsonburg	Op	Channel,		
			Levee & Wall	7,300	Urban
Clarion R.	Ridgway	Op	Channel	12,370	Urban
Red Bank Cr.	Brookville	Op	Channel	16,500	Urban
Stump Cr.	Sykesville	Op	Channel		
			& Levee	7,260	Urban
Mahoning Cr.	Big River	Op	Channel	18,770	Urban
Cannoquenessing Cr.	Butler	Op	Channel	17,730	Urban
Allegheny R.	Kittanning	Op	Channel	4,600	Urban
Bull Cr.	Tarentum	Op	Channel	5,130	Urban
Loyalhanna Cr.	Latrobe	Op	Channel	23,400	Urban
Oil Cr.	Oil City	Op	Levee	800	Urban
Sandy Lick Cr.	Reynoldsville	Op	Channel	11,400	Urban
Mahoning Cr.	Punxsutawney	Op	Wall &		
			Levee	14,500	Urban
L. Conemaugh R.	Wilmore	Op	Levee &		
			Channel	1,950	Urban

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Stony Cr.	Johnstown	Op	Channel	2,700	Urban
Monongahela Basin:					
Pike Run	Granville	Op	Levee & Channel	2,700	Urban
Turtle Cr.	Turtle Cr.	Op	Channel	33,200	Urban
Trout Run	Portage	Op	Wall	-	Urban
Dunlap Cr.	Dunlap Cr.	Op	Channel	-	Rural
Ohio Basin: (Direct)					
Burgetts Fork	Burgettstown	Op	Channel	11,500	Urb. - Rur.
Burgetts Fork	Slovan	Op	Channel	9,900	Urb. - Rur.
Chartier's Cr.	Washington	Op	Channel & Levee	9,350	Urb. - Rur.
Chartier's Cr. (2)	Canonsburg- Houston Carnegie- Bridgeville	UC	Channel	83,700	Urb. - Rur.
Susquehanna Basin:					
Cowanesque R.	Elkland	Op	Levee	15,200	Urban
West Branch	Williamsport	Op	Levee & Wall	75,000	Urban
West Branch	Milton	Op	Channel	10,000	Urban
Lackawanna R.	Scranton	Op	Levee & Wall	3,600	Urban
Susquehanna R.	Wilkes-Barre	Op	Levee & Wall	28,000	Urban
Susquehanna R.	Sunbury	Op	Levee & Wall	26,100	Urban
Susquehanna R.	Kingston	Op	Levee	18,430	Urban
Susquehanna R.	Plymouth	Op	Levee	8,680	Urban
Susquehanna R.	Swoyersville	Op	Levee & Wall	19,460	Urban

(d) *Flood Plain Information Studies*

Flood plain information studies have been completed for Meadville, North Huntingdon Township, Elco-North Charleroi, West Brownsville-California, East Bethlehem-Centerville, Monongahela to Union, Carrol Township to Donora, Jefferson Borough, Martins Creek, Lycoming Creek, Loyalsock Creek, Susquehanna River, Williamsport, Bentleyville-Fallowfield Township, Neshannock Creek, Shenango-Mahoning River, and Corry.

(2) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Area Controlled (Sq. Mi.)</u>	
Cory Creek, Tioga	FC	(land treatment only)			
Mill Run, Crawford	FC,FWL	2		8.77	6,791
North Fork Cowanesque, Potter	FC	1		3.40	667
Saul-Mathay, Mercer	FC,WS,FWL	3	1.2	4.50	1,960

(3) *U.S. Geological Survey Flood Plain Information Studies*

Studies are completed at Lewisburg and Minersville.

(4) *Non-Federal*

(a) *Reservoirs (Major)*

<u>Project & County</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>
Delaware R. Basin:		
Gouldsboro Lake, Monroe	R	255
Lake Wallenpaupack, Wayne	P	5,760
Susquehanna R. Basin:		
Lake Altoona, Blair	WS	70
Lake August, Snyder	R	3,000
Big Elk Lake, Susquehanna	WS,P	84
Black Moshannon Lake, Centre	R	250
Lake Carey, Wyoming	R	263
Colyer Lake, Centre	R	17
Galeton Dam, Potter	WS,R	-
Glendale Lake, Cambria	R	1,740
Lake Gordon, Bedford	WS	120
Hills Creek Lake, Tioga	R	137
Horton Dam, Susquehanna	R	-
Thomas Koon Lake, Bedford	WS	268
Laurel Creek Lake, Mifflin	WS	-
Little Buffalo Creek Lake, Perry	R	90
Little Pine Creek Lake, Lycoming	FC,R	634
Lock Haven Lake, Clinton	R	100
Lower Dam, Blair	WS	43
Lyman Run Lake, Potter	R	40
Meadows Grounds Lake, Fulton	R	204
Mill Run Lake, Blair	WS	77
No. 2 Reservoir, Northumberland	WS	3
No. 6 Reservoir, Northumberland	WS	-
Ole Bull Dam, Potter	R	-
Raystown Lake, Huntingdon	P	600
Shaver Creek Lake, Huntingdon	R	72
Shawnee Lake, Bedford	FC,R	451

<u>Project & County</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>
Silver Dam, Susquehanna	R	83
George B. Stevenson Dam, Cameron	FC,R	142
Stillwater Lake, Susquehanna	WS	350
Sunbury Lake, Snyder	R	3,000
Swatara Gap Lake, Schuylkill	R,WS	700
Tangle Lake, Susquehanna	WS,P	42
Tunkhannock Lake, Wyoming	R	205
Warner Ridge Lake, Huntingdon	P	175
Water Supply Dam, Lycoming	WS	61
Lake Winola, Wyoming	R,P	190
Ohio R. Basin:		
Lake Arthur, Butler	R	3,255
J. C. Bacon Dam, Ambridge	WS	409
Beaver Run Reservoir, Vandergrift	WS	1,125
Bradford Reservoir, Bradford	WS	102
Canadohta Lake, Crawford	R	560
Coxes Creek (Lake Somerset), Somerset	WS,R,FWL	497
Edinboro Lake, Edinboro	WS	240
High Point Lake, Somerset	R	342
Howell's Run Lake, Cambria	WS	82
Indian Lake, Somerset	R	750
Lake Irene, Ridgeway	R	255
Keystone Lake, Westmoreland	R	78
Lake Latonka, Mercer	R	320
Latrobe Reservoir, Latrobe	WS	113
McConnell Mill Run Lake, Lawrence	WS	375
North Fork Lake, Somerset	WS	94
Piney Dam, Clarion	P,R	690
Pymatuning Dam, Mercer	FC,LF,R	16,420
Quemahoning, Somerset	FC	900
Raccoon Park Dam, Beaver	R	101
Ridgeway Waterworks Dam, Ridgeway	WS	75
Ryerson Station Dam, Greene	R	61
Sandy Creek Dam, Mercer	R	1,860
Salt Lick Lake, Cambria	WS	67
Tamarack Lake, Crawford	FWL	562
Two Lick Creek Dam, Indiana	WS for P	500
Wilmore Lake, Cambria	WS	-
Yellow Creek Dam, Beaver	R	740
Lake Erie Drainage:		
Bull Reservoir, Erie	WS	243

(b) *Local Protection Projects*

<u>Location</u>	<u>County</u>	<u>Type Project</u>
Athens	Bradford	Levee
Sayre	Bradford	Levee, Bank Stabilization
Tioga	Tioga	Levee, Channel Improvement
Danville	Montour	Levee
Barnesboro	Cambria	Levee, Channel Improvement
Patton	Cambria	Channel, Clearing, Imp.
Milesburg	Centre	Channel Improvement
Milton	Northumberland	Bank Stabilization
Huntington-Southfield	Huntington	Levee, Channel Improvement
Everett	Bedford	Levee
Boynton	Somerset	Levee
Confluence	Somerset	Levee
Lockwood	Somerset	Levee, Channel Improvement
Windber	Somerset	Levee, Channel Improvement
Hawley	Wayne	Levee, Channel, Dam
Honesdale	Wayne	Channel Improvement
McAdoo	Schuylkill	Channel Improvement
Stroudsburg	Monroe	Levee, Floodwall, Ponding
Weissport Twp.	Carbon	Levee
White Mills	Wayne	Channel, Dam
Mayfield and Olyphant	Lackawanna	Channel Improvement
Blakely	Lackawanna	Drainage
Throop and Dickson City	Lackawanna	Levee
Scranton	Lackawanna	Levee, Channel Improvement
Moosic	Lackawanna	Levee, Channel Improvement
Duryea	Luzerne	Levee
Wyoming	Luzerne	Channel Improvement
Plymouth	Luzerne	Dam
Macanaqua	Luzerne	Levee
Genesee	Potter	Channel Improvement
Wesleyville	Erie	Channel Improvement

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Aquashicola	FC,WS,R	900	45,000	—

Aquashicola Reservoir would provide additional flood damage reduction, water supply and recreational opportunities to enhance growth prospects in Carbon County and the Lehigh Valley.

2. Navigation

Construction of a small boat harbor has been authorized at the mouth of Elk Creek, including a 1,600 foot breakwater, and entrance channel of 8 foot depth and a dock depth of 4 to 6 feet.

3. Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Sandy Lick Creek	Clearfield	Channel Imp.	20,000	Urban
Bald Eagle Creek	Tyrone	Channel Imp.		Urban
Sink Run		Flume,		
Schell Run		Tunnel		
Clarion River	Ridgway	Extend Channel		Urban
Susquehanna R.	Williamsport	Channel Imp.		Urban
Ten Mile Creek	Marianna	Channel Imp.		Urban

The reduction in flooding afforded by these projects will make land available for higher type industrial and commercial development.

4. Flood Plain Information Studies

Studies are scheduled for the entire Ohio River main stem and at Archbold, Athens, Bedford, Blakeslee, Bloomsburg, Bridgeport, Bridgeville, Bristol, Curwensville, Danville, North Huntingdon Township, Meadville, Corry, Hempfield Township, California, West Brownsville, Charleroi, Neshannock Creek, Bentlyville, Fallowfield Township, Shenango and Mahoning Rivers in Lawrence County.

(b) U.S. Department of Agriculture Upstream Watershed Projects

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Controlled (Sq. Mi.)</u>	
Briar Cr., Columbia, Luzerne	FC,R	2	-	7.7	1,500
Brodhead Cr., Monroe, Pike	FC,R	4	-	18.8	4,550
Dunlap Cr., Fayette	FC,FWL	2	1.0	3.5	1,400
Greene-Dreher, Monroe	FC,R	16	-	30.7	7,210
Lackawaxen Tribs., Wayne	FC	7	-	5.4	1,190
L. Schuylkill R., Carbon, Berks, Schuylkill	FC,FWL	4	0.5	35.1	11,080
L. Shenango R., Mercer, Crawford	FC,R	6	0.8	54.0	8,640
Marsh Cr., Tioga	FC,WS,R	3	-	13.2	4,000

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Martin Cr., Susquehanna	FC	2	-	1.2	190
Mauch Chunk Cr., Carbon, Schuylkill	FC,WS,R	1	-	6.0	5,320
Middle Cr., Mifflin, Snyder, Union	FC,WS,R	3	0.6	56.0	13,190
Oil Cr., Crawford, Erie, Warren	FC	6	-	72.2	10,990
Sandy Cr., Crawford, Mercer	FC,FWL	2	-	58.8	25,360
Wheeling Cr., (Part) Greene, Washington	FC,R	7	-	201.0	35,870
Harmon Cr., Washington	FC,WS,FWL	14	-	20.0	4,640
Mill Cr., Tioga	FC,WS,FWL	3	-	4.5	1,960

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers*

1. *Major Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield WQ (cfs)</u>	<u>Installed Hydropower (MW)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
St. Petersburg	FC,WQ,WS, P,R,FWL,ED	10,140	1200-1600	420	981,300*	240,000

* Plus a pumped storage reservoir with 15,500 AF storage.

St. Petersburg Reservoir (Volume 9, Chapter 11, Part III)

St. Petersburg Reservoir, on the Clarion River near its confluence with the Allegheny River, in addition to the above, would provide 110,000 acre-feet of water quality control storage, and a combined storage of 575,000 acre-feet for hydropower, water supply, water quality, recreation, and fish and wildlife improvement. The recreational lands would be developed to support outdoor recreation use along with attendant commercial enterprises. A natural scenic and recreational corridor to the Cook Forest State Park would also be included. The reservoir would become part of the Ohio River flood control system. There is at present a possibility of the Clarion River becoming designated a scenic river; such use would be reconcilable with the reservoir and the natural corridor. Annual project costs and benefits are estimated to be \$16,599,000 and \$18,896,000 respectively. About 20,000 acres of strip mined lands would be reclaimed for recreation, residential, commercial and industrial development, and to enhance environmental quality. An associated acid mine drainage abatement program would be required, costing about \$16.7 million. Should the project be authorized, early starts on the installation of the acid mine drainage abatement measures, and the reclamation of lands disturbed by mining, should be initiated during pre-construction planning of the rest of the project because effectiveness of such actions takes several years to realize. Annual development costs and benefits would be \$12,939,000 and \$64,691,000 respectively providing 12,251 new jobs.

2. Local Protection Project

<u>Project</u>	<u>Purposes</u>	<u>Structure</u>	<u>Length (ft.)</u>	<u>Estimated Cost (\$000)</u>
Tamaqua	FC,ED	10' Tunnel	2,930	2,355

Tamaqua LPP (Volume 6, Chapter 2, Part III)

The Tamaqua Project would intercept the flood waters of Wabash Creek and discharge them through the tunnel into the Little Schuylkill River below the Tamaqua business district. Alleviation of flooding is imperative for completion of urban renewal program and future economic development. Annual costs and benefits of the project would be \$118,000 and \$137,000. The annual development costs and benefits are \$351,000 and \$829,000 respectively, providing 250 new jobs.

(b) U.S. Department of Agriculture

1. Watershed Projects (For Early Action)

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>			
Upper Casselman R., Somerset	FC,WS,R, FWL	5	-	60.6	26,260	1,979
*Stony Cr., Cambria	FC,R	5	-	124.3	35,320	7,851
Jacobs Cr., Fayette	FC,R	3	3.6	39.1	8,200	3,823
Brokenstraw Cr., Warren	FC,R	6	-	152.3	43,220	5,788
*Upper French Cr., Erie	FC,WS,R	3	-	103.5	48,500	8,100
*Blacklick Cr., Cambria-Indiana	FC,R	2	-	36.3	15,200	5,086
*Connoquenessing Cr., Allegheny-Butler	FC,WS,R	21	-	147.0	43,650	14,637
*Sewickley Cr., Westmoreland	FC,WS	2	2.1	4.4	2,250	3,529
*Wills Cr., Bedford-Somerset	FC,WS,R	4	-	46.9	22,400	5,121

* Denotes watersheds having economic development and expansion as a primary purpose - To be specially authorized.

Upper Casselman River Watershed Program, should be planned to form a development unit with Upper Casselman Reservoir (CE) in Maryland, providing flood control, recreation, and fish and wildlife opportunities and water supply to the Meyersdale Growth Center. Pennsylvania has requested the Stony Creek Project for its impact on the Johnstown urban economy; coordination with the Corps program is essential. The Jacobs Creek Project is needed for its impact on the Connells-Uniontown Growth Center. Brokenstraw and Upper French Creek, projects in New York and Pennsylvania, are elements in the Allegheny Basin Plan. The Blacklick Project will enhance the completed Conemaugh River Reservoir

with its effect upon the Indiana Growth Center. The Connoquenessing Project will aid in growth in Butler. The Sewickley Project will aid in flood-freeing lands projects for urban use between Greensburg and Youngwood. The Wills Creek Project will enhance the Cumberland, Maryland, flood control project and meet needs for flood control, water supply, and recreation in the rural area.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned under an acceleration of going programs before 1990 are:

Dundaff Creek	Upper Allegheny R.
Sugar Creek	Little Loyalsock Cr.
*Towanda Creek	*Babb Creek
*Larrus Creek	Raccoon Creek
*Muncy Creek	Indian Creek
Tributary of Catawissa Cr.	LeBoeuf Creek
Tributary of Roaring Cr.	Mahoning Creek
Turtle Creek	Oswego Creek
*Tributary of Mahantango Cr.	Potato Creek
*Tributary of Tuscarora Cr.	Sandy Lick Creek
Little Juniata Creek	Tionesta Creek
*Big Run	Upper Loyalhanna Cr.
*Sideling Hill Creek	West Branch Clarion R.
*Little Aughwick Creek	Upper Tioga River
*Chapman Run	Nescopeck Creek

* From state and local surveys and studies.

Incomplete data show that 13 of these watersheds would provide 93,500 acre-feet of storage for flood prevention; 84,500 acre-feet for recreation; 29,200 acre-feet for municipal and industrial water supply at an estimated first cost of \$60,592,000. Average annual benefits for these projects would total an estimated \$5,732,000.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	89,640	1,873
Grassland			
Plantings	Acres	32,940	400
Renovation	Acres	75,380	916
Critical Area Stabilization			
Roadbanks	Acres	4,040	1,414
Surface Mined Areas	Acres	151,360	15,136
Recreation and Wildlife Land			
Farm Ponds	No.	106	43
Pond Management	No.	540	35
Recreation Access Roads	Miles	213	3,887
Wildlife Habitat Development	Acres	30,260	2,179
Wildlife Habitat Preservation	Acres	122,980	246

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs</u> <u>(\$000)</u>
Picnic Areas	Acres	8,360	12,960
Camping Areas	Acres	3,310	16,565
Recreation Area Planting	Acres	3,810	762
Conservation Plans	No.	12,400	2,950
Soil Survey	Acres		
Forest and Woodland			
Management Plans	No.	1,650	249
Tree Planting	Acres	16,000	880
Erosion Control	Acres	440	9
Harvest Cutting	Acres	8,600	77
Hydrologic Stand Improvement	Acres	20,600	743
Woodland Grazing Control	Acres	8,600	36
Total			61,360

4. *Forest Service Accelerated Treatment Program*

The accelerated land treatment measures in the 473,800 acres of the Allegheny National Forest are:

<u>Measure</u>	<u>Amount</u> <u>(Acres)</u>	<u>Costs</u> <u>(\$000)</u>
Timber		
Tree Planting	17,000	1,224
Timber Stand Improvement	37,200	178
Soil and Water		
Gully Stabilization	10	3
Sheet Erosion Control	300	11
Streambank Stabilization	60	452
Stream Channel Clearing	10	2
Rehabilitated Abandoned Roads and Trails	80	15
Mined Area Stabilization	10	2
Pollution Abatement	880	400
Soil Survey	700,000	70
Watershed Analysis	300,000	70
Fish and Wildlife	564,000	1,147
Total		3,574

5. *Forest Service Recreation Development*

The Allegheny National Forest is in northwest Pennsylvania and is all within the Allegheny River Basin (Ohio River). Access to the area will improve by the completion of Interstate Highways 79 and 80; other highways are needed.

Total costs of the Forest Service 10-year Recreation Plan is 31,449,000 dollars. The plan includes recreation facilities on 1,300 acres of land at 20 locations and 46 recreation lakes with a total surface area of 1,950 acres. In addition, special developments are planned at the Corps Allegheny Reservoir (Allegheny Reservoir Recreation Area) and on the Tionesta Reservoir (Glaesnor Run Recreation Area). The proposed developments are included in the Appalachian Regional Commission's Highlands Recreation Study.

(c) *Commonwealth of Pennsylvania*

1. *Recreation Projects*

<u>Project</u>	<u>Purposes</u>	<u>Recreation Pool (Acres)</u>	<u>Yields WS (mgd)</u>	<u>Visitor Days Per Year</u>	<u>Estimated Cost (\$000)</u>
Otocsin	WS,R	1,432	3.0	7,500,500	6,150
Naturealm	R,Education	-	-	1,500,000	13,580

a. *Lake Otocsin* (Volume 11, Chapter 19, Part III)

Otocsin Recreation Project would be located in Clearfield County, 80 miles northeast of Pittsburgh. The three recreation areas in the plan would be Lake Otocsin Resort and Lodge, Elliott Interchange Area (with Interstate 80), and a Wilderness Area. Public and private costs would total \$41,000,000. Pennsylvania is seeking a way to build the dam and construct the associated facilities which should induce private investment of \$14,000,000. Private investors would build the lodge, cabins, etc. (\$27,000,000). No Federal funds are now programmed, but this project should be considered eligible for grant-in-aid funds in appropriate Federal programs. The development would result in 1,900 new jobs. Annual project costs would be \$1,098,000 and annual user and redevelopment benefits would be \$2,030,000. Regional developmental annual costs would be \$1,534,000 and benefits would be \$2,734,000.

b. *Naturealm* (Volume 11, Chapter 20, Part III)

The Naturealm Project would be located along the shores of 1,640 acre Glendale Lake in Prince Gallitzin State Park in Cambria County. The project elements would be: (1) a conservation education area to contain a natural science center, auditorium, museum and student center complete with dormitories; (2) a conservation practices area, forestry demonstration unit and wildlife observation areas; (3) a nature preserve area. While Pennsylvania is currently proceeding with planning and construction on this project, in order to accelerate its construction and bring it to full scope, the Commonwealth is seeking a way to augment funds available for planning and construction; supporting private developments around the project will cost \$14,021,000. There would be 815 new jobs resulting from the project. Annual project costs would be \$1,325,000 and benefits would be \$1,566,000. Regional development annual costs would be \$1,981,000 and benefits would be \$4,370,000. There is no direct Federal involvement in the project as presently scoped, but this project should be considered eligible for grant-in-aid funds in appropriate Federal programs.

2. *Mine-Drainage, Mine-Disturbed Land Treatment, and Watershed Rehabilitation*

The Commonwealth of Pennsylvania has two active programs in this category which are in accordance with and included in the recommended plan. These are:

a. *Mine Drainage Pollution Abatement Program*

One objective of this program is to abate pollution from abandoned mines through the least expensive combination of construction and treatment practices. Elements include (1) locating sources of pollution; (2) engineering studies; (3) construction; and (4) operation and maintenance. The voters of the Commonwealth have authorized a bond issue to help finance this program. Some watershed studies, demonstration projects, and research have already been completed by State and Federal agencies, and abatement measures are being constructed. In addition, the Commonwealth strictly enforces laws which regulate active mines to prevent pollution. Specific mine drainage abatement projects should be expedited in the Lackawanna and Wyoming Valleys, the Clarion River Basin, the Casselman River Basin, the Upper West Branch Susquehanna River Basin, and the Tioga River Basin.

b. *Lackawanna River-Susquehanna River Mine Drainage Abatement, Subsidence Prevention, and Flood Protection*

This is a program to alleviate critical conditions which have been created by the cessation of pumping that has accompanied the closing of anthracite mines in the Lackawanna and Wyoming Valleys.

3. *Local Protection Projects*

The Commonwealth has recommended the following local flood protection projects: Sechler's Run Flood Protection Project (cost: \$1,150,000) to protect industrial and commercial areas of Danville; Abrahams Creek Flood Protection Project (cost: \$500,000) to build a levee and channel improvements and alleviate flooding in Wyoming and West Wyoming (Luzerne County); Sam's Run Flood Protection Project (cost: \$320,000) to repair and extend channel improvements on Sam's Run for the protection of residential and industrial areas in Johnstown and Lorain Borough.

(3) *Major Continuing Studies*

(a) *Interagency*

The Susquehanna River Basin Study is scheduled for completion in 1970. The study objective is to determine all present and future water resource needs in the Basin and to formulate a development plan to meet these needs. Projections used in the Appalachian Water Resources Survey are similar to the projections used in the Susquehanna Study.

The Susquehanna River Basin Mine Drainage Study, authorized by a resolution of the U.S. Senate Committee on Public Works, adopted 14 April 1964, should be expanded to include the Schuylkill and Lehigh Watersheds of the Delaware River Basin. That study would then encompass the mine-disturbed land reclamation, water rehabilitation and mine pollution abatement problems of the entire anthracite region of Appalachia. In addition, high priority consideration should be given to specific problems involving the Upper West Branch Susquehanna River and the Tioga River which affect Corps of Engineers' reservoir projects. It is recommended that this study be directed toward expanding, expediting, or implementing those projects of Pennsylvania's "action" programs and those planned for the immediate future. Certain priorities have been set by Pennsylvania, and are reflected in the projects underway, involving detailed engineering studies, quick start projects, and construction where the alternate solutions have been reviewed. Other Federal agencies have already completed a careful evaluation of pollution abatement efforts required in the Susquehanna Basin. The Corps effort would be channeled into (a) detailed engineering of high priority projects previously identified by others and/or (b) expansion of the engineering surveys by others without duplication or overlapping information now available. This procedure is in keeping with the intent of the resolution and also will promptly implement "action" pollution abatement works.

(b) *Corps of Engineers*

Basin development investigations underway include:

<u>River</u>	<u>State</u>	<u>Completion</u>
Youghiogheny River	Pennsylvania and Maryland	1972
Monongahela River	Pennsylvania and West Virginia	1974

<u>Name</u>	<u>Purpose</u>	<u>Completion Scheduled</u>
Monongahela River	Navigation Improvement	1968-1971
Ohio River	Navigation Improvement	1968-1971
Presque Isle, Erie, Pa.	Modify Beach, Erosion Control	1971

Other studies recommended for continued planning are the investigation of needs for improvement for flood control, low flow augmentation, acid mine drainage abatement, water supply, recreation, and fish and wildlife conservation on Raccoon, Laurel Hill, Upper Stony, Clear Shade, Big Sandy, Dunkard, Ten Mile, Little Connoquenessing, Conneaut, Neshannock, Connoquenessing, Little Conemaugh Creeks, Upper Casselman River, Girtys Run and Glade Run. Congressional resolutions exist for studies on Big Sandy and Raccoon Creeks.

Continuation of studies for small boat harbor improvements at Walnut Creek and North East is also recommended.

(4) *Future Studies*

A comprehensive study is recommended for the Allegheny, Beaver and Upper Ohio River Basins to assess problems of flooding, water quality, water supply, recreation, environmental improvement and economic development.

Present studies in the Conemaugh River Basin in the vicinity of Johnstown should be accelerated and coordinated with the USDA upstream watershed project for the Stony Creek area.

The Commonwealth recommends a study be made for dredging the West Bay Area of the Port of Erie and proper disposal of dredged material (Estimated cost: \$2 million), and further study of additional rehabilitation of Presque Isle.

Studies of the effectiveness of the system of flood control reservoirs throughout the Ohio River Basin should be continued after completion of the flood plain information studies along the main stem. These studies should have as goals determination of flood hazard stages at individual developmental sites, and determination of the overall expansion benefits from adding additional flood control storage to the system.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

13. THE PLAN FOR APPALACHIAN SOUTH CAROLINA

There are six counties of South Carolina located in Appalachia, primarily in the Piedmont physiographic province. Drainage lies in the headwaters of the Santee and Savannah River systems. See Map 10, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoir

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Savannah R. Basin: Hartwell	Comp	FC,P,LF	56,000	2,842,700	264

The Hartwell Reservoir can provide additional water supply to many communities under contractual arrangement between the Corps of Engineers and the communities.

(b) Local Protection Project

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Santee R. Basin: Saluda River	Pickens & Greenville	Op.	Chan.	184,800	Agriculture

(c) Flood Plain Information Studies

Flood plain information studies have been completed for Lawson's Fork at Spartanburg.

(2) U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Bushy Cr., Anderson, Pickens	FC	4	5.3	11.88	3,466
Huff Cr., Greenville	FC	5	1.1	22.98	6,640
Twelve Mi. Cr., Pickens	FC	7	23.2	34.65	8,705
Big Cr., Anderson	FC,WS	2	4.36	7.41	2,595

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Broad Mouth Cr., Anderson	FC	4	11.22	8.12	1,881
Coneross Cr., Oconee	FC	5	14.34	26.11	7,364

(3) *Non-Federal Reservoirs (Major)*

(a) *Duke Power Company*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Jocassee	UC	P	7,570	956,000	140
Keowee	UC	P	18,370	1,160,000	610

(b) *Municipal*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield (MGD)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
City of Greenville:						
Poinsett	Op.	WS	1,080	41.	76,000	—
Table Rock	Op.	WS	500	19.5	29,220	—
City of Spartanburg:						
Spartanburg	Op.	WS	200	—	4,460	—
Wm. C. Bowen	Op.	WS	1,600	40.0	24,080	—

The Keowee-Toxaway project is under active consideration as potential source of water supply for the Greenville area.

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Trotters Shoals	P,R,FWL	26,000	1,166,200	300

2. Flood Plain Information Studies

Flood plain information studies at Greenville, Spartanburg, Easley, Seneca, Liberty, Anderson, and Belton are recommended to permit development of flood plain management programs.

(b) U.S. Department of Agriculture Upstream Watershed Projects

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Georges Cr., Pickens	FC,WS	5	6.25	17.57	5,656
South Tyger R., Greenville	FC,WS	6	15.02	33.86	8,216
Thicketty Cr., Cherokee, Spartanburg	FC,FWL	9	11.21	52.88	11,841
Three & Twenty Cr., Anderson, Pickens	FC	7	20.00	40.16	10,551
Wilson Cr., Abbeville, Anderson	FC	3	5.24	12.51	3,442

(2) Early Action, Authorization or Acceleration of Programs and Project Studies Needed

(a) Corps of Engineers

1. Reservoir

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield</u>		<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
			<u>WQ (cfs)</u>	<u>WS (mgd)</u>		
Clinchfield	FC,WS,WQ, R,ED	20,220	1,330*	443	1,036,000	\$58,565

* Gross flow, seasonally adjusted below the mouth of the Pacolet River.

Clinchfield Reservoir Project (Volume 7, Chapter 5, Part III)

The Clinchfield multiple-purpose reservoir project is located in Rutherford and Polk Counties, North Carolina and Spartanburg County, South Carolina. The reservoir would control about 571 square miles of drainage area, contain slightly over a million acre-feet of storage and provide a conservation pool area of about 20,200 acres. Reservoir storage of 90,000 acre-feet would control floods up to and including the standard project flood event, thereby providing a substantial reduction of flooding damages along the Broad River downstream to the Pacolet River, and to a lesser extent downstream to Columbia, South Carolina. Yield from the 806,000 acre-feet conservation storage can substantially meet the water supply needs of a seven county area of North and South Carolina, including the growth centers of Spartanburg, South Carolina and Rutherfordton, Spindale and Forest City, North Carolina, in addition to meeting low flow objectives for water quality on the Broad River. Recreation facilities and land are included to accommodate an ultimate use of about six million visitor-days annually for general recreation, fishing and hunting, serving a market area extending to Greenville, South Carolina, and Asheville and Charlotte, North Carolina.

Annual project costs and developmental costs are estimated to be \$2,856,000 and \$11,207,000, respectively. Average annual benefits to users of the project are estimated at \$4,865,000 and expansion benefits to the Appalachian Region are estimated at \$94,650,000.

2. Local Protection Project

<u>Project</u>	<u>Purpose</u>	<u>Structure</u>	<u>Length (mi.)</u>	<u>Estimated Cost (\$000)</u>
Reedy River Greenville	FC	Channel Improvement	8.0	\$1,976

The Reedy River LPP survey report was prepared under the on-going general investigations program of the Corps. Although the project is urgently needed, and has been incorporated in this plan, its authorization is not herein recommended. The report on the project is, at time of writing, being processed separately for submission to the Congress.

(b) U.S. Department of Agriculture

1. Watershed Projects (For Early Action)

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>	<u>Estimated</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>		
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>(AF)</u>	<u>Cost (\$000)</u>
				<u>(Sq. Mi.)</u>		
Cherokee Cr., Cherokee	FC,WS	1	—	10.2	6,950	370.5
South Pacolet R., Greenville, Spartanburg	FC,WS,I,R	5	9.0	30.9	16,845	2,359.1
Eighteen Mile Cr., Anderson, Oconee, Pickens	FC,WS,R	4	11.0	30.2	11,275	1,734.2
Oolenoy R., Pickens	FC,R	11	11.0	29.15	14,400	1,519.3

The Cherokee Creek project could meet the water supply needs for Gaffney while providing flood control and recreation benefits.

South Pacolet River project could increase the dependable yield of the existing water supply reservoirs at Spartanburg and provide additional flood control and recreation benefits.

Eighteen Mile Creek project could meet part of the water supply needs of the Seneca-Central-Liberty growth centers while reducing flooding damages and providing additional recreation opportunities. Additional storage of over 10,000 acre-feet is available to meet further needs.

Oolenoy River project is an integral part of the proposed expansion of Table Rock State Park by providing additional recreation opportunities. It will reduce flood damages to some of the most fertile land in South Carolina.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned and installed under an acceleration of going programs before 1990 are: Little Beaver Dam and North and Middle Tyger River. These watersheds could provide 41,300 acre-feet of storage for flood prevention; 3,700 acre-feet for recreation; 3,200 acre-feet for municipal and industrial water supply at an estimated first cost of \$3,923,000. Average annual benefits for these projects would total an estimated \$247,500.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	23,780	582
Grassland			
Plantings	Acres	18,620	248
Renovation	Acres	9,010	120
Critical Roadbanks	Acres	4,690	1,407
Surface Mined Areas	Acres	—	—
Recreation and Wildlife Land			
Farm Ponds	No.	13	4
Pond Management	No.	880	57
Recreation Access Roads	Miles	54	995
Wildlife Habitat Development	Acres	2,410	174
Wildlife Habitat Preservation	Acres	5,600	11
Picnic Areas	Acres	2,220	3,442
Camping Areas	Acres	890	4,454
Recreation Area Planting	Acres	1,020	204
Conservation Plans	No.	180	80
Soil Survey	Acres	463,050	140
Forest and Woodland			
Management Plans	No.	660	112
Tree Planting	Acres	63,000	1,619
Erosion Control	Acres	16,000	547
Harvest Cutting	Acres	55,000	209
Hydrologic Stand Improvement	Acres	34,000	544
Woodland Grazing Control	Acres	39,000	127
Total			15,036

4. Forest Service Accelerated Treatment Program

The accelerated land treatment measures for the Sumter National Forest are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	4,200	252
Timber Stand Improvement	2,000	40

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Soil and Water		
Gully Stabilization	40	20
Stream Channel Clearing	100	20
Stabilization of Abandoned Roads and Trails	520	26
Soil Survey	40,000	—
Watershed Analysis	60,000	8
Fish and Wildlife	25,000	18
Total		384

5. *Forest Service Recreation Development*

The Sumter National Forest, accessible from Interstate 85 and the Blue Ridge Parkway Extension, features the scenic, crystal clear Chatooga River. Three special recreation projects are recommended for accelerated implementation within 10 years.

A recreation complex at Burrell's Ford, providing diversified water oriented activities with particular emphasis on canoeing, costing an estimated \$750,000.

The Cherry Hill Dam, providing a 20 to 50 acre lake adjacent to an existing camp ground at an estimated cost of \$250,000.

The Yellow Branch Dam, an impoundment to provide additional attractions for an established heavily-used picnic site at a cost of \$250,000.

Classification of the Upper Chatooga (under study prescribed by PL 90-452) as a Wild or Scenic River, may necessitate revision of the above plans.

(3) *Major Continuing Studies*

Current basin studies of the Yadkin-Pee Dee and the Santee River System are underway. Both studies are oriented towards development of the rivers to meet identified needs in and outside of Appalachia. Participation by USDA in the Santee River Basin Study should be continued until the plan is complete.

(4) *Future Studies*

The following future studies are recommended:

Study of the Upper Saluda and Broad River Basins to resolve flooding, water supply, water quality and recreation problems with an analysis of the most favorable means for conveyance of water from the Clinchfield Reservoir and/or Keowee-Toxaway Project to meet water quantity and quality needs in the Greenville-Spartanburg-Easley growth area.

A reconnaissance study of flooding at Spartanburg to define the flooding hazards, flood plain development trends and means for alleviating flood problems.

A study of water quality management in the Upper Savannah River Basin to evaluate the effect of the Keowee-Toxaway project and related developments on water quality problems.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

14. THE PLAN FOR APPALACHIAN TENNESSEE

There are fifty counties in the State of Tennessee that are included in the Appalachian Region. The 15 northwestern counties are in the watersheds of the Cumberland River and its tributaries; the remainder are drained by the Tennessee River and its tributaries. See Map 11, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Cumberland R. Basin:					
Cordell Hull Res.	UC	N,P,R	13,920	310,900	100
Dale Hollow Res.	Op	FC,P,R	21,880	1,706,000	54
Center Hill Res.	Op	FC,P,R	14,590	2,092,000	135

(b) Navigation

The Cordell Hull Lock and Dam, on the Cumberland River, is under construction by the Corps of Engineers, and is expected to be placed in full service by 1972. There are 5 locks and dams in Appalachian Tennessee on the Tennessee River as follows: Nickajack, Chickamauga, Watts Bar, Melton Hill, and Fort Loudoun. The locks on the Tennessee River were constructed by the Tennessee Valley Authority and turned over to the Corps of Engineers for maintenance and operation. The Tennessee River is navigable to Knoxville, and when Cordell Hull Lock and Dam are completed, the Cumberland will be navigable to Celina, Tennessee, near the Tennessee-Kentucky state line.

(c) Local Protection Projects

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Coal Cr.	Lake City	Op	Levee & Channel	13,000	Urban
Piney Cr.	Spring City	Op	Levee & Channel	11,600	Urban

(d) Flood Plain Information Studies

Flood plain information studies have been completed for Carthage, Celina and Gainesboro.

(2) *Tennessee Valley Authority*

(a) *Reservoirs*

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Tennessee R. Basin:					
Tims Ford	UC	FC,P,WS, WQ,R,FWL	10,700	617,000	45
Nickajack	Op	P,N	10,900	254,000	97
Chickamauga	Op	FC,P,N	34,500	739,000	108
Watts Bar	Op	FC,P,N	38,500	1,175,000	150
Ocoee No. 1	Op	P	1,900	87,300	18
Melton Hill	Op	P,N	5,000	126,000	72
Fort Loudoun	Op	FC,P,N	14,400	393,000	128
Tellico	UC	FC,P,N	16,500	447,300	
Douglas	Op	FC,P,N	22,900	1,475,000	112
Cherokee	Op	FC,P,N	23,400	1,544,000	120
Norris	Op	FC,P,N	26,900	2,555,000	101
Boone	Op	FC,P,N	4,100	193,400	75
Ft. Patrick Henry	Op	P	850	26,900	36
South Holston	Op	FC,P,N	6,600	764,000	35
Watauga	Op	FC,P,N	5,600	677,000	50
Normandy	Aprv	FC,WS,WQ, R,FWL	3,000	134,000	-
Cumberland River Basin:					
Great Falls	Op	P	1,500	51,600	32

(b) *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Stringers Branch	Red Bank	UC	Channel	7,400	Urban
Little Pigeon R.	Sevierville	Op	Channel	21,500	Urban
Indian Creek	Oliver Springs	UC	Channel	6,400	Urban
So. Chickamauga	Chattanooga	Aprv	Levee	20,500	Urban

(c) *Flood Plain Information Studies*

Flood plain information studies have been completed at the following communities in the Appalachian portion of Tennessee: Alcoa, Athens, Briceville, Bristol, Calhoun, Charleston, Chattanooga, Church Hill, Cleveland, Clinton, Copperhill, Dayton, Dunlap, East Ridge, Elizabethton, Erwin, Etowah, Frost Bottom, Gatlinburg, Harriman, Hixson, Jasper, Jefferson City, Johnson City, Kingsport, Kingston, Knoxville, LaFollette, Lake City, Laurel Grove, Lenoir City, Loudon, Manchester, Maryville, Maynardville, Morristown, Mountain City, Newport, New Taxewell, Oak Ridge, Oliver Springs, Philadelphia, Pigeon Forge, Red Bank, Richard City, Roan Mountain, Rogersville, Rockwood, Sequatchie, Sevierville, Sneedville, South Pittsburg, Spring City, Surgoinsville, Sweetwater, Tazewell, Tellico Plains, Townsend, Tullahoma, and Whitwell. In addition, studies have been completed for all or parts of Anderson, Blount, Knox, and Marion Counties. A study for Englewood is underway.

(3) *U.S. Department of Agriculture Upstream Watershed Project (Completed or in Operation)*

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Capacity (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Proctor Cr., Clay	FC	0	5.3	-	-

(4) *U.S. Air Force Reservoir*

<u>Project</u>	<u>Status</u>	<u>Purpose</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Woods Lake	Op	WS,R	3,900	79,900	-

(5) *Non-Federal Reservoirs (Major)*

<u>Project</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Alcoa:				
Calderwood	P	500	41,200	121.5
Chilhowee Lake	P	1,700	49,200	50

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENTAL STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers Flood Plain Information Studies*

Flood plain information studies are recommended for Jellico and Woodbury.

(b) *Tennessee Valley Authority*

1. *Continuing Study*

A potential pumped storage power project of 1.35 million kilowatts capacity at the Racoon Mountain site west of Chattanooga is being considered for construction by TVA. The project would have an upper pool of 24,900 acre-feet and would use the existing Nickajack Reservoir as a lower pool. Estimated cost of the project is \$130 million which would be financed from TVA power revenues and revenue bonds.

2. *Local Protection Projects*

In the Tennessee River Basin, the TVA proposes to investigate, or continue investigation, of the following projects for local flood protection: Tullahoma, Chattanooga, Briceville, Gatlinburg, Kingsport, Johnson City and Elizabethton.

3. *Flood Plain Information Studies*

Flood Plain Information Studies by TVA are recommended for Estill Springs and Jonesboro.

(c) *U.S. Department of Agriculture Upstream Watershed Projects*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Capacity (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Jennings Cr., Clay, Jackson, Macon	FC	13	19.3	29.3	6,372
Line Cr., Clay, Macon Monroe (Ky)	FC	5	29.6	30.76	8,895
Mill Cr., Jackson, Overton, Putnam	FC	1	12.67	17.87	2,700
Crow Cr., Franklin, Jackson (Ala) Marion	FC	-	52.6	-	-
Pine Cr., Scott	FC,WS,R	4	6.7	6.11	2,187
Roarks Cove, Franklin	FC	-	23.9	-	-
Shady Valley, Johnson	FC	-	10.3	-	-
Lick Cr.,* Green, Washington	FC	41	100.5	125.49	27,058

* Inactive

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers Reservoir*

<u>Project & County</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Storage (AF)</u>	<u>Installed Hydropower (MW)</u>
Devils Jumps, McCreary, Ky., Scott, Pickett, Fentress, Tenn.	P,R	29,000	4,136,000	480

The above data pertains to Devils Jumps as presented in House Document 175, 87th Congress. A review report by the Corps of Engineers of the previous study of the Big South Fork, Cumberland River, is needed. In conjunction with this study, a second, interagency study, involving the Corps of Engineers, U. S. Department of the Interior, and the U.S. Department of Agriculture to determine possible alternatives to Devils Jumps should receive early action.

(b) *U.S. Department of Agriculture*

i. *Watershed Project (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>	<u>Estimated Structural Cost (\$000)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>			
Salt Lick Cr., Clay Macon Monroe (Ky.)	FC,WS,R	9	40.5	57.2	16,145	2,908.1

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CORPS OF ENGINEERS CINCINNATI OHIO
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Planning of the Salt Lick Creek Upstream Watershed project should be expedited. The project would consist of both floodwater retarding and multiple purpose structures. These structures would provide 12,495 acre-feet of flood retarding storage, 2,200 acre-feet of municipal water supply, 1,450 acre-feet for recreation purposes, and could, at maximum development, provide 11,800 acre-feet of storage for water supply purposes. Water supply needs are anticipated at Lafayette and Red Boiling Springs, and water utility districts which serve, or will serve, a large portion of Macon, Clay, and Monroe Counties. The cost shown above is for maximum storage development.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects in the tributary basins of the Cumberland River which should be planned and installed under an acceleration of going programs before 1990 are: Hickory Creek, Roaring River, Smith Fork Creek, Putnam-Cane Creek, Coahulla Creek, Boiling Fork Creek, Bent Creek, Bull Run Creek, Mountain Creek, Charles Creek, Perkins Creek, Blackwater Creek, Black Wolf Creek, and Calfkiller River. Upstream projects which have been investigated and planned for integration into TVA developmental plans are Horse Creek and Sweetwater Creek. These watersheds could provide 84,800 acre feet of storage for flood prevention; 8,000 acre feet for recreation; 12,000 acre feet for municipal and industrial water supply at an estimated first cost of \$14,518,000. Average annual benefits for these projects would total \$876,800.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	64,410	788
Grassland			
Plantings	Acres	184,230	1,276
Renovation	Acres	201,860	1,343
Critical Area Stabilization			
Roadbanks	Acres	8,180	2,863
Surface Mined Areas	Acres	2,540	190
Recreation and Wildlife Land			
Farm Ponds	No.	550	236
Pond Management	No.	1,150	75
Recreation Access Roads	Miles	41	756
Wildlife Habitat Development	Acres	4,900	353
Wildlife Habitat Preservation	Acres	2,460	5
Picnic Areas	Acres	2,170	3,364
Camping Areas	Acres	830	4,154
Recreation Area Planting	Acres	960	192
Conservation Plans	No.	12,470	2,900
Soil Survey	Acres	626,590	290
Forest and Woodland			
Management Plans	No.	1,100	187
Tree Planting	Acres	60,100	1,545
Erosion Control	Acres	31,100	1,062
Harvest Cutting	Acres	90,200	343
Hydrologic Stand Improvement	Acres	166,000	2,656
Woodland Grazing Control	Acres	113,500	369
Total			24,947

4. Forest Service Accelerated Treatment Program

The accelerated land treatment measures in the Cherokee, Nantahala, Pisgah and Chattahoochee National Forests are:

<u>Measure</u>	<u>Amount (Acre)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	69,500	4,170
Timber Stand Improvement	106,000	1,948
Soil and Water		
Gully Stabilization	186	93
Sheet Erosion Control	2,590	388
Streambank Stabilization	15	20
Rehabilitated Abandoned Roads and Trails	3,982	200
Mined Area Stabilization	53	63
Soil Survey	570,000	171
Watershed Analysis	455,000	137
Fish and Wildlife	35,000	96
Total		7,286

5. Forest Service Recreation Development

Accelerated recreation development has been proposed by the National Forest Service at six locations in the National Forest lands in the State of Tennessee. They are, in order of priority:

<u>Priority</u>	<u>Name</u>	<u>County</u>	<u>Est. Cost (\$000)</u>
1	Tellico Dam	Monroe	2,500.0
2	Chilhowee	Polk	4,500.0
3	Wautagua Lake	Carter	5,500.0
4	Indian Boundary Complex	Monroe	2,000.0
5	South Holston	Sullivan	5,000.0
6	Starr Mountain Complex	Monroe	2,800.0
Total			22,300.0

The Forest Service estimates that the annual visitor-day use of these developments would be 2,454,000 by about 1980. The design load for these complexes is 42,500 visitors at one time.

(3) Major Continuing Studies

(a) Interagency

Continue interagency study in the Big South Fork area of the Cumberland River Basin (Devils Jumps, and alternatives, and USDA Upstream Watersheds).

(b) *Corps of Engineers*

Investigations of the Collins River basin should be continued to insure that water supply, water quality, flow augmentation, recreation potential, flood protection, and irrigation needs are met to allow continuation of the economic development already in progress.

(c) *Tennessee Valley Authority*

Investigations are in progress by TVA for potential multi-purpose developments in the Lower Hiwassee, Sequatchie and Emory River areas. All these investigations include flood control, water supply, water quality, and recreation possibilities among the purposes being considered. Extension of navigation is also being considered in the Lower Hiwassee. In addition, an investigation for the Doe River area of northeast Tennessee is scheduled to consider possibilities for combining recreation with flood control for Elizabethton.

(4) *Future Studies*

Considerable local development is taking place at Jellico, Tennessee, and much of it, by necessity, will be in the flood plain of Elk Creek, a tributary of the Cumberland River. A restudy of the flood problems in this community should be scheduled for accomplishment when the desirability is evident.

After 1990, plan the remaining feasible watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

15. THE PLAN FOR APPALACHIAN VIRGINIA

There are 21 counties of the Commonwealth of Virginia included in the Appalachian Region. These counties are located in the Potomac, James, Kanawha, Tennessee, and Big Sandy River Basins. Local drainage into the Potomac Basin is limited to portions of Highland County in the upstream headwaters of the South Branch of the Potomac. Other local drainage includes the Cowpasture and Jackson Rivers, Johns Creek and Craig Creek, tributaries of the James River; New River, a tributary of the Kanawha; Levisa Fork, a tributary of the Big Sandy; and the Clinch, Powell, and Holston Rivers, tributaries of the Tennessee River. See Map 12, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>
James River Basin:				
Gathright Reservoir	UC	FC,WQ,R	2,530	341,000
Big Sandy River Basin:				
John W. Flannagan Reservoir	Op	FC,WQ,R	927	145,700
N. Fork Pound Reservoir	Op	FC,WS,R,FWL	154	11,293

(b) Local Protection Project

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Kanawha R. Basin:					
Chestnut Cr.	Galax	Op	Channel	13,700	Urban

(c) Flood Plain Information Studies

Flood Plain Information Studies have been completed or are in preparation for Buchanan, Clifton Forge, Covington, Eagle Rock and Grundy.

(2) Tennessee Valley Authority

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Median Summer Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Tennessee River Basin:					
South Holston Lake	Op	FC,P,N	6,600	764,000	35
Clear Lake - Beaver Lake	Op	FC,R	50	7,800	-

(b) *Local Protection Project*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Guest River	Coeburn	Op	Channel	17,000	Urban

(c) *Flood Plain Information Studies*

Flood plain information studies have been prepared for Appalachia, Big Stone Gap, Bristol, Carbo, Carterton, Castlewood, Cedar Bluff, Cleveland, Clinchport, Coeburn, Damascus, Dungannon, Fort Blackmore, Gate City, Marion, Norton, Pennington Gap, Raven, Richlands, St. Paul, Tazewell, Weber City, and Russell County.

(3) *U.S. Department of Agriculture Upstream Watershed Project (Completed or in Operation)*

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Kanawha River Basin: Back Cr., Pulaski	FC	-	11.1	-	-

(4) *Non-Federal Reservoirs*

<u>Project</u>	<u>Purpose</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
James River Basin: W. Va. Pulp & Paper Co. Res.	WS	-	-	-
Douthat State Park Res.	R	70	-	-
Kanawha River Basin: Claytor Reservoir*	P	4,540	232,000	75
Byllesby Reservoir*	P	335	3,540	22

* Owned by Appalachian Power Company.

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers Flood Plain Information Studies*

Flood plain information studies are recommended for Potts Creek near Covington, Craig Creek near Eagle Rock, Cowpasture River near Clifton Forge and Bluefield.

(b) *Tennessee Valley Authority Local Protection Project*

TVA studies for local flood protection in conjunction with overall developmental planning are to be continued for Big Stone Gap and for the area industrial park near Duffield.

(c) *U.S. Department of Agriculture Upstream Watershed Projects*

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage Area Controlled (Sq. Mi.)</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>		
Roanoke River Basin: S. Fork Roanoke River, Floyd, Montgomery & Roanoke	FC	4	6.97	84.91	15,098
James River Basin: Johns Creek, Craig & Giles	FC	4	17.80	31.15	5,288

(d) *Non-Federal Reservoirs*

<u>Project</u>	<u>Purpose</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Kanawha River Basin: Blue Ridge (Upper) Res.	P,WQ	26,000	2,010,000	1,600
Blue Ridge (Lower) Res.	P,FC,WQ	14,400	1,251,000	200

The Commonwealth of Virginia favors the development of the Moores Ferry site by the Appalachian Power Company. The Moores Ferry Reservoir was authorized as a unit of the 1938 comprehensive plan for control of the Ohio River.

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*

(a) *Corps of Engineers Reservoir*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield WQ (cfs)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
James River Basin: Hipes Res.	FC,WQ,R, FWL,ED	4,540	80-800	304,700	23,547

Hipes Reservoir Project (Volume 6, Chapter 4, Part III)

Hipes multi-purpose reservoir will be located in Botetourt and Craig Counties (within Jefferson National Forest) on Craig Creek, Virginia, James River Basin, about 125 miles upstream from Richmond and 25 miles north of Roanoke. The project also includes a trout rearing station, and downstream fishing sites along Craig Creek to its mouth (14.8 mi.). The trout rearing station, cost-shared with the Commonwealth of Virginia, would provide game fish throughout the area and greatly enhance the recreation potential. The project, with Gathright Reservoir in operation, fits Appalachian objectives by reducing flood damages along the Upper James River in Water Sub-region C by 90 percent (10 percent incremental impact from Hipes) and will provide water quality control on James River outside Appalachia at Lynchburg and Richmond. Streams stocked from rearing station and downstream fishing sites will

attract fishermen from outside Appalachia. The reservoir will provide a portion of recreation needs in the region. Interstate Highways 64 and 81 provide easy access from Washington, D.C. and Richmond, Virginia population centers.

Annual project costs and developmental costs are estimated to be \$1,523,000 and \$80,000 respectively. Project benefits are estimated at \$2,296,000. Average annual benefits to the Appalachian Region are estimated to be \$1,233,000.

(b) *U.S. Department of Agriculture*

1. *Watershed Projects (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>	<u>Estimated</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>		
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>Storage</u>	<u>Cost (\$000)</u>
				<u>(Sq. Mi.)</u>	<u>(AF)</u>	
Headwaters Holston River, Bland, Smyth & Tazewell	FC,WS,R	6	-	162.60	49,125	5,326.0
Upper Bluestone River, Tazewell	FC,WQ	4	0.27	34.11	11,480	2,580.9
Upper Clinch River, Tazewell	FC,WS	9	-	9.56	2,880	1,551.0

The Headwaters, Holston River watershed, investigated by the Soil Conservation Service, has an area of about 235 square miles. The project would reduce flood damage to both rural and urban lands, the community of Saltville providing the major portion of the benefits for this function. The project could also provide storage for both municipal and industrial use, and would help meet some of the outdoor recreation needs. The preliminary studies included 11,000 acre feet of storage for municipal and industrial purposes. The studies indicated that as much as 47,000 acre feet of additional storage capacity could also be developed, if needed. Since there is an industrial waste pollution in the North Fork, Holston River at and downstream of Saltville, future studies should be a joint effort with TVA, FWPCA and Commonwealth of Virginia to determine the advisability of developing a substantial amount of water quality storage.

The Upper Bluestone River project would reduce flooding in Bluefield, Va., and could provide storage for improvement of water quality along the river downstream from the city.

The Upper Clinch Valley project would provide flood protection and water supply storage for the City of Tazewell.

2. *Upstream Watershed Projects (For Acceleration)*

There are 9 upstream watershed projects in the James River Basin that have been investigated and planned under going programs. These projects are largely concerned with National Forest Lands and should be funded and developed as scheduled by the Forest Service. These projects are: Back Creek, Calpasture Creek, Catawba Creek, Cowpasture Creek, Dunlap Creek, Jackson River 2, Jackson River 5, Ogle Creek, and Potts Creek in the James River Basin; Little Stony Creek, Mill Creek, and Peak Creek in the Kanawha River Basin; and Indian and Martin Creeks in the Tennessee River Basin. These Watersheds could provide 154,700 acre feet of storage for flood prevention; 16,500 acre feet for recreation; 43,300 acre feet for municipal and industrial water supply and 6,300 acre feet for water quality at an estimated first cost of \$38,216,000. Average annual benefits for these projects would total \$1,888,000.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment measures for a 10-year period as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	27,500	516
Grassland			
Plantings	Acres	16,500	135
Renovation	Acres	105,000	861
Critical Area Stabilization			
Roadbanks	Acres	4,810	1,683
Surface Mined Areas	Acres	22,200	1,177
Recreation and Wildlife Land			
Farm Ponds	No.	64	26
Pond Management	No.	330	21
Recreation Access Roads	Miles	15	285
Wildlife Habitat Development	Acres	1,200	87
Wildlife Habitat Preservation	Acres	2,220	4
Picnic Areas	Acres	210	326
Camping	Acres	86	400
Recreation Area Planting	Acres	100	20
Conservation Plans	No.	3,040	870
Soil Survey	Acres	3,707,180	2,870
Forest and Woodland			
Management Plans	No.	1,430	237
Tree Planting	Acres	26,400	679
Erosion Control	Acres	11,500	393
Harvest Cutting	Acres	187,200	745
Hydrologic Stand Improvement	Acres	222,100	3,459
Woodland Grazing Control	Acres	91,700	293
Total			15,087

4. Forest Service Accelerated Treatment Program

The accelerated land treatment measures in the George Washington and Jefferson National Forests are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	157,170	9,432
Timber Stand Improvement	321,700	3,559
Soil and Water		
Gully Stailization	747	401
Sheet Erosion Control	2,098	320
Streambank Stabilization	348	319
Stream Channel Clearing	1,356	169
Rehabilitated Abandoned Roads & Trails	1,212	130
Mined Area Stabilization	272	37

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Soil Survey	467,000	102
Watershed Analysis	322,000	96
Fish and Wildlife	138,000	693
Total		15,258

5. *Forest Service Recreation Development*

Accelerated recreation development has been proposed by the National Forest Service at 5 locations in the Commonwealth of Virginia. These, in order of priority, are:

<u>Priority</u>	<u>Name</u>	<u>County</u>	<u>Estimated Cost (\$000)</u>
1	Hipes Reservoir	Botetourt	— *
	New Castle Complex	Craig	1,500
	Buchanan Complex	Botetourt	1,500
2	Hidden Valley	Bath	6,500
3	Norton Area	Wise	3,800
Total			13,300 *

* Does not include costs for Hipes Reservoir which are included in project costs for this reservoir.

The Forest Service estimates that the annual visitor day use will be 1,125,000 by about 1980. The design load for these complexes, including Hipes Reservoir, is 9,600 visitors at one time.

(3) *Major Continuing Studies*

Continuing studies that affect Appalachian Virginia are:

Comprehensive Survey Report studies for James River Basin;

Comprehensive interagency studies for development of water resources in the Kanawha River Basin (this basin includes the Upper New River on which the authorized Moores Ferry project is located);

Survey Report study for the Big Sandy River and tributaries; and

Water quality improvement alternatives for the North Fork Holston River area downstream from Saltville are being studied by TVA as part of a cooperative investigation conducted by the North Fork Holston River Technical Committee.

(4) *Future Studies*

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

16. THE PLAN FOR APPALACHIAN WEST VIRGINIA

The Appalachian Region includes the entire state of West Virginia, which is drained primarily by the Ohio and the Potomac River Systems. West Virginia has designated as protected streams within the natural stream preservation system Greenbrier River from its mouth to Knapps Creek; Anthony Creek, a tributary of the Greenbrier River; and Cranberry River of the Gauley Basin. See Map 13, Volume 2.

A. EXISTING DEVELOPMENT

(1) Corps of Engineers

(a) Reservoirs

<u>Project</u>	<u>Status</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Installed Hydropower (MW)</u>
Kanawha Basin:					
Bluestone Lake	Op	FC,R	1,970	631,000	-
Summersville Lake	Op	FC,WQ,R	2,723	423,800	-
Sutton Lake	Op	FC,WQ,R	1,570	265,300	-
Monongahela Basin:					
Tygart Lake	Op	FC,N,R	1,740	187,800	-
Stonewall Jackson Lake	AE&D	FC,WS,WQ,R	2,530	75,200	-
Rowlesburg Lake	AE&D	FC,WQ,R,P	5,800	831,700	350
L. Kanawha Basin:					
Burnsville Lake	UC	FC,WQ,R	980	68,500	-
Twelvepole Creek Basin:					
Beech Fork Lake	UC	FC,R	720	32,600	-
East Lynn Lake	UC	FC,R	1,005	82,500	-
Guyandotte Basin:					
R.D. Bailey Lake	UC	FC,WQ,R	2,850	203,700	-

(b) Navigation

The Ohio River Navigation System of locks and dams is being modernized to include facilities for increasing traffic and 1200-ft. tows. The seven included in West Virginia are Gallipolis, Racine, Belleville, Willow Island, Hannibal, Pike Island and New Cumberland.

There are three locks and dams on the 91 mile navigable stretch of the Kanawha River. They are Winfield, Marmet and London.

The Monongahela River is navigable from Pittsburgh, Pennsylvania to Fairmount, West Virginia (128 miles). Three of the locks and dams, Morgantown, Hildebrand and Opekiska, are in West Virginia.

The lower reaches (3 to 4 miles) of the Little Kanawha and Big Sandy Rivers are navigable.

(c) *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Ohio River Basin:					
Ohio and Big Sandy	Ceredo-Kenova	Op	Wall & Levee	22,000	Urban
Ohio River	Huntington	Op	Levee	60,900	Urban
Ohio River	Parkersburg	Op	Levee/Channel Improvements	20,000	Urban
Ohio River	Point Pleasant	Op	Levee/Channel Improvements	12,105	Urban
Fishing Cr.	Pine Grove	Op	Channel Improvements	9,500	Rural/Urban
Fishing Cr.	Smithfield	Op	Channel Improvements	6,000	Rural/Urban
Fishing Cr.	Jacksonburg	Op	Channel Improvements	4,000	Rural/Urban
Middle Island Cr.	West Union	Op	Channel Improvements	4,000+	Rural/Urban
Fourpole Cr.	Huntington	Op	Channel Improvements	13,700	Urban
Harmon Cr.	Colliers	Op	Channel Improvements	5,000	Urban
Monongahela River Basin:					
Buckhannon R.	Buckhannon	Op	Channel Improvements/Cutoff	24,170	Urban
Tygart R.	Elkins	Op	Levee/Channel Improvements	3,600	Urban
Polk Cr.	Weston	Op	Channel Improvements	2,000	Urban
Stonecoal Cr.	Weston	Op	Channel Improvements	5,600	Rural/Urban
Elk Cr.	Harrison	Op	Channel Improvements	8,740	Rural
Bingamon Cr.	Wyatt	Op	Channel Improvements	1,350	Rural
Little Kanawha River Basin:					
N.Fk. Hughes	Cairo	Op	Channel Improvements	13,700	Rural
Guyandotte River Basin:					
Middle Fork Mud R.	Griffithsville-Yawkey	Op	Channel Improvements	18,900	Rural
Guyandotte	Barboursville	Op	Bank Prot.	-	Urban
Big Sandy River Basin:					
Tug Fork	Williamson	Op	Levee	2,135	Urban
Kanawha River Basin:					
Meadow R.	E. Rainelle	Op	Channel Improvements	23,000	Rural/Urban

<u>Stream</u>	<u>City or County</u>	<u>Status</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Kanawha River Basin: (cont'd)					
Brush Cr.	Princeton	Op	Channel Improvements	20,400	Urban
Bluestone R.	Bramwell	Op	Channel Improvements	14,000	Rural/Urban
Bluestone R.	Montcalm	Op	Channel Improvements	15,800	Rural/Urban
Cherry River	Richwood	Op	Channel Improvements	-	Rural/Urban
Potomac River Basin:					
Buffalo Cr.	Bayard	Op	Levee/Channel Improvements	2,000	Urban
North Branch	Ridgeley - Cumberland, Md.	Op	Levee/Channel	17,400	Urban
North Branch	Blaine - Kitzmiller, Md.	Op	Levee/Channel Improvements	5,800	Urban

(d) *Flood Plain Information Studies*

A flood plain information study has been completed at Milton on the Mud River.

(2) *U.S. Department of Agriculture Upstream Watershed Projects (Completed or in Operation)*

<u>Project & County</u>	<u>Purpose</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total Storage (AF)</u>
		<u>FWR (No.)</u>	<u>Chan. (Mi.)</u>	<u>Area Controlled (Sq. Mi.)</u>	
Potomac Basin:					
Warm Springs Run, Morgan	FC	9	—	2.0	320
Ohio River Tributaries:					
Upper Grave Cr., Marshall	FC,WS	7	3.6	2.0	500
Monongahela Basin:					
Salem Fork - Ten Mile, Harrison	FC	8	4.0	3.0	680
Polk Cr., Lewis	FC	8	—	6.6	1,780
Shooks Run, Barbour	FC		0.7		—
Pecks Run, Barbour	FC		6.0		—
Little Kanawha Basin:					
Bonds Cr., Ritchie	FC,FWL	1	5.8	0.5	240
Saltlick Cr., Braxton	FC	5	—	19.8	4,259
Kanawha Basin:					
Marlin Run, Pocahontas	FC	1	—	1.2	290
Daves Fk. - Christians Fk., Mercer	FC	3	1.2	2.4	550

(3) *Non-Federal Reservoirs (Major)*

<u>Project & County</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Storage (AF)</u>	<u>Installed Hydropower (MW)</u>
Plum Orchard Lake (W.Va.) Fayette	R	202	2,000	-
Steven Branch Lake (Private) Raleigh	R	303	8,000	-
Flat Top Lake (Private) Raleigh	R	225	2,200	-
Lake Lynn, Monongalia	P,R	1,411	72,300	51

B. *RECOMMENDED PLAN OF DEVELOPMENT OR DEVELOPMENT STUDIES*

(1) *Early Action, Authorization not Required*

(a) *Corps of Engineers*

1. *Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Yield</u>		<u>Total Capacity (AF)</u>
			<u>WQ (cfs)</u>	<u>WS (mgd)</u>	
Big Sandy Basin: Panther Creek Lake	FC,WQ,R	288	15	-	16,900
Little Kanawha Basin: West Fork Lake	FC,WQ,R	1,775	162	-	98,400
Leading Cr. Lake	FC,WQ,R	-	111	-	97,900

2. *Local Protection Projects*

<u>Stream</u>	<u>City or County</u>	<u>Type</u>	<u>Length (ft.)</u>	<u>Protected Area</u>
Big Sandy River Basin: Dry Fork	Berwind	Channel Improvements	7,000	Rural/Urban
Kanawha River Basin: Paint Cr.	Pax	Channel Improvements	16,000	Rural/Urban
Potomac River Basin: S. Potomac R.	Keyser	Levee/Channel Improvements	4,520	Urban

3. *Flood Plain Information Studies*

Reports are programmed for the entire Ohio River main stem and Big Sandy River main stem - by counties and have been requested for Charleston, Glenville, Grantsville, Iager, Kermit, Madison, Ripley, Tridelpia-Valley Grove, War, Welch and Williamson.

(b) *U.S. Department of Agriculture Upstream Watershed Projects*

Project & County	Purposes	Structures		Drainage	Total
		FWR (No.)	Chan. (Mi.)	Area Controlled (Sq. Mi.)	Storage (AF)
Potomac Basin:					
Lunice Cr., Grant	FC	5	0.6	47.4	8,730
New Cr., Whites Run, Grant	FC,WS	12	—	14.7	4,430
Patterson Cr., Grant	FC,WS	35	0.9	139.6	27,988
South Fork, Hardy	FC	24	—	118.7	30,470
Ohio River Tributaries:					
Wheeling Cr., Ohio	FC,R	7	—	201.0	35,870
Pond Run Cr., Wood	FC	1	6.2	1.9	260
Monongahela Basin:					
Upper Deckers, Monongalia	FC,FWL	5	7.2	14.6	2,040
Kanawha Basin:					
Elk-Two Mile Cr., Kanawha	FC	6	—	6.4	1,430
Brush Cr., Mercer	FC,WS,R	11	5.9	15.0	4,840
Big Ditch Run, Webster	FC,R	1	3.8	1.2	595
Blakes & Armours Cr., Kanawha	FC,R	1	—	2.4	750
Kanawha Two Mile Cr., Kanawha	FC,R	4	—	6.6	1,786
Big Sandy Basin:					
Mate Cr., Mingo	FC,WS,R	3	6.7	8.3	2,600

(2) *Early Action, Authorization or Acceleration of Programs and Project Studies Needed*(a) *Corps of Engineers Reservoirs*

<u>Project</u>	<u>Purposes</u>	<u>Conservation Pool Area (Acres)</u>	<u>Total Capacity (AF)</u>	<u>Estimated Cost (\$000)</u>
Royal Glen Lake	FC,R,FWL,ED	1,150	128,000	29,080
N. Mountain Lake	LF,R	3,560	97,500	26,263
L. Cacapon Lake	LF,R	1,030	53,800	20,810

1. *North Mountain Lake and Little Cacapon Lake*

North Mountain Lake on Back Creek and Little Cacapon Lake on Little Cacapon River are two elements of the plan for augmentation of low flows in the Potomac River. These projects, along with four others, are recommended in the Chief of Engineers Report which is now being processed to the Congress. Annual project costs and user plus redevelopment benefits for North Mountain Reservoir are estimated to be \$1,392,000 and \$2,719,000 and for Little Cacapon Reservoir are estimated to be \$904,000 and 1,262,000 dollars.

2. *Royal Glen Project (Volume 6, Chapter 3, Part III)*

The Royal Glen Project will lie at the confluence of the North Fork and main stem of the South Branch of the Potomac River, upstream from Petersburg. The lake will provide

storage for 90,000 acre feet of floodwater and 38,000 acre feet of water for recreation and enhancement of fishing values downstream. Annual project costs and benefits are estimated to be \$1,679,000 and 1,467,000 dollars. Major expansion effects stem from freeing 500 acres of developable land in South Petersburg from flood hazard. The project includes a small channel improvement. Total costs would be \$4,783,000 and the average annual developmental benefits would be \$7,668,000. It is estimated that 7,666 new jobs would result from the project and that the population would increase by 19,780 persons. All costs, save local costs in the channel improvement, will be Federal since the Forest Service will manage the recreation facilities in conjunction with the Spruce Knob-Seneca Rocks National Recreation Area in the Monongahela National Forest. The Forest Service will also construct and develop eight recreation lakes in that forest. Small tributary flood control structures are needed upstream.

(b) *U.S. Department of Agriculture*

1. *Watershed Projects (For Early Action)*

<u>Project & County</u>	<u>Purposes</u>	<u>Structures</u>		<u>Drainage</u>	<u>Total</u>	<u>Estimated</u>
		<u>FWR</u>	<u>Chan.</u>	<u>Area</u>		
		<u>(No.)</u>	<u>(Mi.)</u>	<u>Controlled</u>	<u>(AF)</u>	<u>Structural</u>
				<u>(Sq. Mi.)</u>		<u>Costs (\$000)</u>
Monongahela Basin:						
*Upper Buckhannon, Randolph	FC,R	10	0	51.9	13,060	4,840
*Elk Cr., Barbour	FC,R	11	0	59.6	17,580	4,143
*Simpson Cr., Barbour	FC,WS,R	11	0	33.8	13,810	2,620
*Three Fork Cr., Monongalia	FC,R	5	0.4	54.1	13,030	2,516
*Limestone Run, Harrison	FC,R	1	0.9	1.1	1,630	891
*Prickett Cr., Marion	FC,R	2	0	12.3	3,700	700
Ohio River Direct Tributaries:						
*King's Cr., Hancock	FC,R	2	0	36.1	9,310	1,195
*Upper Middle I. Cr., Doddridge	FC,R	5	0	75.6	18,375	4,124
Little Kanawha Basin:						
Spring Cr., Calhoun	FC,R,FWL	5	1.0	26.0	13,650	3,000
Upper Kanawha Basin: see discussion - B (3)						
Potomac Basin: see discussion - B (3)						

* Has economic development as a purpose and must be specially authorized.

The Upper Buckhannon River (Monongahela) projects, by SCS and the Corps, would provide needed flood protection and recreation for the Buckhannon Primary Growth Center. Elk Creek, Simpson Creek, Three Fork Creek, Limestone Run and Prickett Creek projects would form parts of a complete plan of development for the Weston-Clarksburg-Fairmont-Morgantown Growth Area; a small LPP project by the Corps on Limestone Run is also under consideration. Spring Creek project, which was not studied in the AWRS, would provide flood protection and water supply for Spencer Secondary Growth Center. Kings Creek project would have its major impact in the Wheeling Primary Growth Center. Upper Middle Island Creek Project would have major impacts in the Parkersburg Growth Center, plus rural impacts.

2. Upstream Watershed Projects (For Acceleration)

Upstream watershed projects which should be planned and installed under acceleration of going programs before 1990 are: Stonecoal Creek, Ten Mile Creek, Laurel Fk. - Bluestone R., Paw Paw Creek, Sandy Creek, Mill Creek (Jackson and Roane Counties), Fourpole Creek and Big Creek. These watersheds could provide 31,100 acre feet of storage for flood prevention; 6,900 acre feet for recreation; 1,900 acre feet for municipal and industrial water supply at an estimated first cost of \$11,882,000. Average annual benefits for these projects would total \$531,800.

3. Land Treatment Measures

U.S. Department of Agriculture's recommendations include accelerated land treatment for a 10-year period, as follows:

<u>Measure</u>	<u>Units</u>	<u>Amount</u>	<u>Costs (\$000)</u>
Cropland	Acres	164,450	2,884
Grassland			
Plantings	Acres	48,250	338
Renovation	Acres	569,700	3,945
Critical Area Stabilization			
Roadbanks	Acres	11,270	3,904
Surface Mined Areas	Acres	89,290	4,732
Recreation and Wildlife Land			
Farm Ponds	No.	353	150
Pond Management	No.	4,800	311
Recreation Access Roads	Miles	266	4,848
Wildlife Habitat Development	Acres	21,920	1,578
Wildlife Habitat Preservation	Acres	270,300	541
Picnic Areas	Acres	10,580	16,400
Camping Areas	Acres	4,230	21,170
Recreation Area Planting	Acres	4,870	2,774
Conservation Plans	No.	15,720	2,860
Soil Survey	Acres	2,346,630	510
Forest and Woodland			
Management Plans	No.	2,580	408
Tree Planting	Acres	22,000	1,122
Erosion Control	Acres	880	18
Harvest Cutting	Acres	16,500	165
Hydrologic Stand Improvement	Acres	22,000	704
Woodland Grazing Control	Acres	66,000	319
Total			69,681

4. Forest Service Accelerated Treatment Program

The accelerated land treatment measures in the George Washington and Monongahela National Forests are:

<u>Measure</u>	<u>Amount (Acres)</u>	<u>Costs (\$000)</u>
Timber		
Tree Planting	33,750	2,038
Timber Stand Improvement	65,020	1,317
Soil and Water		
Gully Stabilization	36	28
Sheet Erosion Control	46	4
Streambank Stabilization	320	158
Stream Channel Clearing	470	243
Rehabilitated Abandoned Roads and Trails	250	77
Mined Area Stabilization	820	414
Soil Survey	1,000,000	90
Watershed Analysis	1,000,000	150
Fish and Wildlife	318,620	394
Total		4,913

5. *Forest Service Recreation Plan*

The 183,000 acres of the George Washington National Forest are in Hampshire, Hardy and Pendleton Counties along the north and west slopes of the Shenandoah Mountains in the Potomac Basin. The Forest Service has developed a 10-year recreation acceleration plan to cost \$4,697,000 providing an additional development in the Capon Furnace Area. Access to the Forest will be improved by completion of Interstate 81, Interstate 64, and Appalachian Highway Corridor H.

The 10-year recreation development program in the Monongahela National Forest would cost \$45,273,000. Areas of emphasis include: (1) Spruce Knob-Seneca Rocks National Recreation Area; (2) Spruce Knob Lakes Recreation Complex; (3) Rowlesburg Reservoir and Horseshoe Lake development in conjunction with the Corps; (4) Recreation impoundments in three upstream watershed reservoir (SCS) and other impoundments with total surface of 925 acres in the Forest; (5) Recreation impoundments in three upstream reservoirs (USDA) in the Potomac Basin; (6) developments with the proposed Corps' Royal Glen Lake; and (7) development of 12 recreation areas totalling 140 acres.

(3) *Major Continuing Studies*

(a) *Kanawha River Basin*

1. *Corps of Engineers*

The Coordinating Committee for the Kanawha Basin Comprehensive Study has selected a tentative plan for development of the water resources of the Basin. In addition to the three existing projects (Bluestone, Sutton and Summersville Lakes), the tentative plan contains 10 major reservoir projects in West Virginia. The projects are Pocatalico River, Big Sandy Creek (Elk), Birch River (Elk), Meadow River (Gauley), Knapp Creek (Greenbrier), Deer Creek (Greenbrier), East Fork (Greenbrier), Indian Creek (Upper New), Bluestone River (Upper New), and Buffalo Creek (Elk). The Committee directed retention in the plan of a reservoir on the main stem of Greenbrier River upstream from Marlinton as an alternate for sites on Deer Creek, East Fork, and Buffalo Creek. They also proposed early action for a survey scope study of a potential Swiss Lake Project on Gauley River, and have included the Swiss Project as a future element in the tentative plan.

2. U.S. Department of Agriculture

The Coordinating Committee for the Comprehensive River Basin Study in the Kanawha Basin tentatively selected 37 upstream watersheds and one USDA Resource Conservation and Development Project (Jumping Branch-Bluestone River). Thirty-three of the upstream watershed projects would lie in West Virginia; seven of these are in the operational or authorized status, and are not listed below. The relative economic development potential of the remaining 26 has not been fully determined.

Lick Br.	Howard Creek	Kellys Creek
Rocky Fork	Grassy Creek	Middle Creek
Georges Creek	Beaver Creek	Upper Birch River
Wertz Hollow	Gypsy Hill	Laurel Creek
Jumping Br. (RC&D)	Upper Meadow R.	Mill Creek (Kan.)
Piney Creek	Cherry R.	U. Pocatalico R.
Meadow Creek	Glade Cr. (Upper)	Davis Creek
Dunloup Creek	Quick Br.	Finney Br.
Ansted Creek	Slaughter Creek	Rock Br.

(b) Potomac River Basin - U.S. Department of Agriculture

The Potomac Basin was authorized for complete flood control and watershed treatment in 1944 (one of 11 basins). Watershed projects are:

North Fork South Branch	North River
South Branch	Lost River
Mill Creek	Sleepy Creek
Little Cacapon River	Opequon Creek

(c) Monongahela River Basin - Corps of Engineers

Projects being studied include Middle Fork (Tygart), Tygart Valley and Buckhannon Rivers, and Teter, Laurel, Hackers, Big Sandy and Ten Mile Creeks. Other possible improvements are also being evaluated. They will be coordinated with the U.S. Department of Agriculture.

(d) Other Major Studies

The Tug Fork Basin (Big Sandy) study is to be completed in 1971. A water resource study is also under way in the Upper Guyandotte River Basin. Mill Creek, at Ripley, is also under study, as is Middle Island Creek.

(4) Future Studies

The Kanawha River Basin Survey Coordinating Committee has recommended a joint State-Federal study to develop a program for land stabilization and management in the areas of severe erosion and siltation resulting from strip mining in the Coal River Basin.

Studies of the effectiveness of the system of flood control reservoirs throughout the Ohio River Basin should be continued after completion of the flood plain information studies along the main stem. These studies should have as goals determination of flood hazard stages at individual developmental sites, and determination of the overall expansion benefits from adding additional flood control storage to the system.

After 1990, plan the remaining feasible upstream watersheds as determined by the most recent USDA Conservation Needs Inventory for Watersheds.

CHAPTER 7 - PROJECT & PLAN ELEMENT ECONOMICS

1. THE SCOPE OF APPALACHIAN EVALUATION PROCEDURES

The assessment of economic benefits and costs provides essential information about the relative and absolute merits of various proposals and projects. Measures of efficiency offer a guide for comparing relative performance against the national efficiency goals which underlie most evaluations of water project economics. However, this report emphasizes not only the efficiency aspects of public water developments, but also the distributive impacts, essentially regional development aspects.

Traditional evaluation procedures have been based either on observed market prices for inputs to, and outputs from, water resource projects, or from simulated market evaluations. The special emphasis placed by PL 89-4 upon regional economic development necessitated development of more representative evaluation methods because of the failure of the market system to operate with full effectiveness in the Appalachian Region. As mentioned in Chapter 5, and discussed more fully in Part IV, Concepts and Methods, market prices and social costs may diverge in some instances, resulting in distortion in the allocation of resources. Pockets of involuntary poverty, of under- and unemployment, within a general economy exhibiting relatively high employment, demonstrate the presence of such distortion. Thus some correction from observed market values is desirable in these circumstances.

Although economic analysis is normally biased towards market models of valuation, the most widely accepted theory of value rests on the premise of *utility*, which is the relative desirability of some good or service to each person. Thus values placed on those goods or services not normally traded in a market are deemphasized in the common practice of economic valuation, although the underlying theory would assert that these goods and services enhance or maximize utility as effectively as marketable ones.

Enlargement of evaluation techniques to encompass the valuation of factors not commonly found in the market place has been attempted in this report to provide a wider range of information for those who must make decisions on the plan proposals. Thus the project reports display benefits both from the nation's and from the Appalachian Region's standpoint. Benefits and costs from a more localized viewpoint are offered in a somewhat implicit form, through the display of local reimbursement costs and the delineation of regional user and expansion benefits.

The measures of environmental costs and benefits are somewhat less explicit than those portrayed for more easily quantified values. Yet, an important commitment to evaluation of environmental benefits and costs has been attempted. Water quality control benefits, general recreation, and fish and wildlife enhancement benefits are included as valued by a simulated market - as has been the case for a number of years. Mitigation measures are included in most project proposals to offset hunting and fishing losses. From these costs a measure of benefits from fishing and hunting opportunities foregone can be imputed. Additional environmental measures are included in some of the project proposals; mine reclamation is part of the St. Petersburg Reservoir proposal, to permit reduction of acid mine discharge and sediment to the level which would permit the reservoir to function properly, and to provide public recreation in buffer areas; and the Logan Reservoir plan includes provisions for public acquisition of the Clear Creek Gorge, downstream from the dam, for environmental preservation. These are additional costs undertaken either to minimize adverse environmental effects, or to enhance and preserve environmental values.

The following paragraphs discuss the kinds of benefits and costs estimated in this report, the techniques utilized, and the performance indices developed to facilitate comparison among project proposals.

2. BENEFIT DEFINITIONS

Two general classes of benefits are recognized; user benefits are the value of goods and services produced by the plan or project, and may be thought of as efficiency gains for both the nation and the region; expansion benefits need not be directly related to the plan or project, but should be thought of as the total change in income flows brought about by the project or plan. Expansion benefits, when fully measured, include the user effects as well as those income changes which arise from secondary activities. However, it is usually possible to make a practical separation of expansion and user effects so that user benefits may be studied separately from the secondary effects. The secondary benefit component in expansion benefits may represent national efficiency gains, as when unemployed resources are brought into play or where development plans make it possible to capture the externalities which may appear; but in most cases, especially in a fully employed economy, secondary benefits are the result of transfers, and are not net national economic gains, although of full value to the region in which they fall.

As both user and expansion benefits can fall into national income and regional income accounts, it is necessary to make careful scrutiny of the character of all benefits. The separation of the benefit categories focuses attention on (1) the direct output of the project, and (2) the "indirect or stemming from" project effects.

It is recognized that the two benefit categories, user and expansion, do not explain all possible project influences. For example, there are often income and social gains due to the redistribution of income which resource projects may bring about. In the absence of explicit income redistribution goals in the Appalachian Regional Development Act, this effect has not been studied in detail. Part IV of this report, Concepts and Methods, discusses several ways in which water resources policies may influence the redistribution of income among regions, as well as among individuals.

3. MEASUREMENT PROBLEMS

Special efforts have been made in this survey to identify the water resource needs of

the Region, with emphasis on correction of water-related impediments to economic development. This has required a careful look at the water requirements of industry and of communities, particularly those serving specialized functions. With present and projected needs identified, using the developmental benchmarks and other guides, the problem of alternative ways of meeting resource needs was examined. The ten sub-regional plans in Part II reflect the complexity of the problems faced in deciding on the best method for meeting needs. Questions of sequencing and timing of developments are in some cases particularly complex, requiring that attention be given to the timing of developments among regions as well as within basins, so that the areas with most pressing problems can be assisted early in the development process.

There are two measurement problems which deserve special mention, the measurement of expansion effects, and isolating the developmental effects of individual resource development activities. The first of these problems was attacked from many angles with the conclusion that the best way to estimate future effects of removing bottlenecks blocking development (i.e., where land can be made flood-free and developable by industry as the result of a flood control project) is to develop a detailed land use and development plan. Such a plan is built on the basis of experience with the types of industries locating in the general area of the project, and knowledge of the present and proposed transportation net. It must include a clear statement of the sources and present conditions of labor and capital, and how they will be influenced by the project. The project analyses in Part III contain several area development plans covering a wide range of geographic and social situations. Where a project may bring about general improvements in established economies (rather than, as above, to lay the basis for a wholly new economy), it is not necessary to develop detailed plans, and may be sufficient merely to estimate the impact on wages and salary flows. In all cases the measurement of economic expansion effects is a complex task, requiring that conditions with and without the project be estimated.

It is recognized that economic development stems, not only from water resource

developments, but also from highways and many other programs of social infrastructure, as well as from the final production demand conditions and technological milieu obtaining at the time. This being so, it raises the very difficult problem of determining the portion of the benefits from future development which may be correctly assigned to a particular resource development project, such as a dam or local protection work which comes into operation concurrently with other developmental investments. The procedures used in this report do not offer a completely satisfactory solution to this problem, but special efforts are made to see that water projects claim only a reasonable share of the development benefits flowing from the full package of development efforts underway in Appalachia. At a minimum, the costs associated with the induced developments, to both the public and private sectors, have been estimated; they are then compared with the expansion benefits in the regional performance index. Additional work needs to be done on the problem of apportioning benefits among the various facilitating developmental projects, looking toward a less arbitrary and more theoretically satisfactory solution.

4. COSTS AND BENEFITS

Explicit costs displayed in this report are market costs for construction of recommended projects, estimated by the usual procedures. Price levels were, for the most part, those current during 1968 and 1969. Each project report designates a time for which costs were current and, since benefits are calculated on the same price levels, the values are comparable. It should be noted that recent price level increases will necessarily mean that the estimated costs and benefits are both underestimated to the degree of change in price indices. Construction costs have been converted to average annual costs, for the economic life of the project (either 50 or 100 years), and estimated interest during construction, plus operation, maintenance and major replacement costs have been added to permit comparison with average annual benefits.

In addition to project costs, special attention has been given to estimation of associated costs which will have to be undertaken by private and public interests to attain the

economic development objectives which can be related to each water resource project. These costs were estimated with less precision but are considered representative.

Each project was formulated and evaluated at the 3-1/4 percent interest rate which was applicable for planning during Fiscal Years 1967 and 1968, and the reports in Parts II and III of this report reflect this rate. Annual costs and benefits have been reevaluated, in accordance with the FY 1970 interest/discount rate of 4-7/8 percent, and the amended values are presented in this Chapter.

User benefits presented in this report were discounted to average annual equivalents by the appropriate interest rate as described above. These benefits are estimated by procedures commonly utilized, and are generally based on the values users would be "willing to pay" for project supplied goods and services. Redevelopment benefits were estimated for each project as the wages of otherwise unemployed or underemployed local labor which could reasonably be expected to be utilized directly for project construction and operation. User and redevelopment benefits (in the national income account) are normally utilized in the index of performance relating to national economic efficiency, and are so presented in this report.

National, and Appalachian regional, income gains resulting from employment induced by or stemming from the project proposals have also been estimated for each project included in this report. The assumption and procedures utilized for this measurement are detailed in Part IV. Essentially, the evaluation procedures are cast against determination of additional employment, and labor incomes, which would result from the economic growth initiated, encouraged or supported by investments in water resources development.

5. INDICES OF PERFORMANCE

The evaluation procedures are of such scope that a single benefit-cost ratio is inappropriate for judging projects. Two principal performance indices are used: (1) the conventional ratio indicating user benefits plus the value of otherwise unemployed labor used in

project construction and operation, to project costs; and (2), a ratio of total wage and salary gains for the Appalachian Region, to total costs. The first should be considered a partial measure of national income gains, since it does not include all national income expansion benefits. The second ratio provides a means for comparing projects on the basis of their contribution to national and regional wages, and is thus also incomplete in that profits, rents, taxes and other income benefits are not included.

Since there are many uncertainties reflected in the events leading to economic growth -- the decisions of private entrepreneurs are crucial -- national expansion effects have been excluded from the national efficiency index. However, because of the clear emphasis placed in PL 89-4 on regional economic development, some of the additional income, including national income, which would be expected for the Appalachian Region is reported and utilized for the regional development performance index, which makes this index of significance to the nation as well as to the region.

6. SPECIFIC COSTS, BENEFITS AND INDICES OF PERFORMANCE

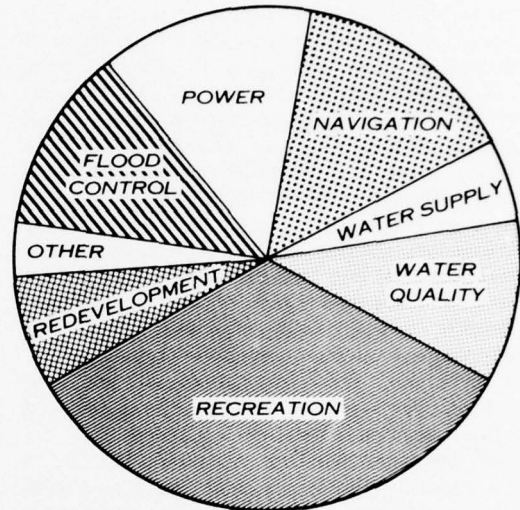
Introduction

The following paragraphs summarize benefits, costs and indices of performance relating to the two primary objectives of this report, and to a lesser extent the minor objectives, for the definite project proposals recommended in this report. More detailed exposition of Corps of Engineers, Tennessee Valley Authority, and state recreation projects can be found in Part III, while information about U.S. Department of Agriculture projects is given in Appendix A.

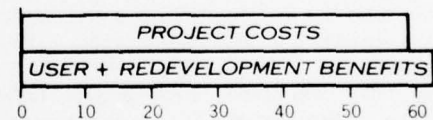
Major Reservoir, Navigation, Local Protection and State Recreation Projects

Benefits and costs for the 11 reservoir projects recommended for authorization, on Page I-7-5, are discounted at 4-7/8 percent interest (current during FY 1970) in accordance with the evaluation procedures prescribed by the Water

Resources Council, while the Lower Knox Reservoir is presented at 3-1/4 percent interest, and all represent a 100-year economic life.



SOURCES OF
NATIONAL INCOME BENEFITS
MAJOR PROJECT PROPOSALS



ANNUAL COSTS & BENEFITS (\$1,000,000)

SOURCE: TABLE 7-1

The Upper French Broad System reported by Tennessee Valley Authority was evaluated at 3-1/4 percent interest and 100-year economic life, consistent with the Water Resources Council directive concerning authorized projects. The Coosa River Navigation project was evaluated at 3-1/4 percent interest and a 50-year economic life, since it is also an authorized project. TVA's Yellow Creek Port project was evaluated at 4-7/8 percent interest and a 25-year economic life. Local Protection Projects recommended for

TABLE 7-1
SUMMARY OF ANNUAL BENEFITS & COSTS (\$1,000) - MAJOR PROJECTS RECOMMENDED IN AWRIS 1/

	User Benefits										Redevelopment Benefits	User & Redevelopment Benefits	Project Costs	National Efficiency Index	Regional Expansion Benefits	Project & Associated Costs	Regional Income Expansion Index
	Flood Control	Power	Navigation	Water Supply	Irrigation	Water Quality	Recreation	Other	Total								
<u>Corps of Engineers Reservoirs For Authorization</u>																	
Royalton Reservoir - Salisburyville Area 2/	570	-	-	30	-	52	240	-	892	171	1,063	2,432	44	32,350	6,749	4.8	
Royal Glen	761	-	-	-	-	-	535	-	1,296	171	1,467	1,679	96	7,668	4,783	1.6	
Hipes 3/	128	-	-	-	-	680	1,315	-	2,123	173	2,296	1,523	1.5	1,233	1,603	8	
Clinchfield	90	-	-	1,528	-	253	2,786	-	4,657	208	4,865	2,856	1.7	94,650	14,063	6.7	
Roaring River	147	-	-	50	-	214	192	-	603	60	663	649	1.03	5,217	1,565	3.3	
Curry Creek	283	-	-	362	-	-	409	-	1,054	92	1,146	946	1.2	4,284	1,377	3.1	
Dalton	418	-	-	157	-	363	1,778	-	2,716	144	2,860	2,640	1.1	118,620	47,110	2.5	
Stannard	25	-	-	43	45	1,284	1,116	-	2,513	78	2,591	2,150	1.2	4,322	3,110	1.4	
St. Petersburg	2,121	8,440	-	-	-	1,700	3,919	867 4/	17,047	1,849	18,896	16,599	1.1	64,691	29,538	2.2	
Whiteoak	230	-	-	371	-	246	1,450	-	2,297	151	2,448	2,573	.95	89,005	17,771	5.0	
Logan	350	-	-	209	-	71	1,956	360 5/	2,946	106	3,052	2,972	1.03	9,818	8,041	1.2	
TOTAL	5,123	8,440	-	2,750	45	4,863	15,696	1,227	38,144	3,203	41,347	37,019	(1.1)	431,858	135,710	3.2	
<u>Corps of Engineers Reservoir for Consideration</u>																	
Lower Knox (3-1/4%)	602	-	-	-	-	224	135	-	961	148	1,109	1,891	6	621	1,935	3	
<u>TVA Reservoirs</u>																	
Upper French Broad System (3-1/4%)	2,363	-	-	360	-	1,164	423	453 6/	4,763	46	4,809	3,619	1.3	15,400	5,829	2.6	
<u>State Projects</u>																	
Otocin (3-1/4%)	-	-	-	-	-	-	2,000	-	2,000	30	2,030	1,098	1.9	2,734	1,543	1.8	
Naturealm (3-1/4%)	-	-	-	-	-	-	1,500	-	1,500	66	1,566	1,325	1.2	4,370	1,981	2.2	
<u>Corps of Engineers Local Protection Projects For Authorization</u>																	
Tamaqua	122	-	-	-	-	-	-	-	122	15	137	118	1.2	829	469	1.8	
Midland	38	-	-	-	-	-	-	-	38	21	59	168	4	61,617	6,568	9.4	
<u>Corps of Engineers Economic Restudy</u>																	
Coosa River Navigation (3-1/4%)	-	-	9,404	-	-	-	601	-	10,005	1,209	11,214	10,264	1.1	56,631	24,754	2.3	
<u>Tennessee Valley Authority</u>																	
Yellow Creek Port	-	-	260	-	-	-	-	156 4/	416	17	433	519	8	7,232	709	10.2	
TOTAL	8,248	8,440	9,664	3,110	45	6,251	20,355	1,836	57,949	4,755 1/	62,704 1	56,021	(1.1)	581,292	179,498	(3.2)	

1/ At 4-7/8 percent interest unless otherwise noted

2/ Elements 1, 2, 3, 4 and 5.

3/ Includes downstream fishery and trout rearing station

4/ Land Enhancement

5/ Nature Area

6/ Shoreline development and roadway user savings from relocations.

authorization by the Corps of Engineers are presented at 4-7/8 percent interest and a 100-year economic life. The Pennsylvania State proposals for Naturealm and Otocsin are presented at 3-1/4 percent interest and a 100-year economic life. Because most reports in Part III are evaluated at 3-1/4 percent interest, and are here reported at 4-7/8 percent, variations in reported average annual benefits and costs will be noted.

Table 7-1 presents a summary of annual benefits and costs, and of indices of performance for the two principal objectives of this report for projects discussed above. A graphic illustration of the relative mix of user and redevelopment benefits reported for the national income (efficiency) objective, and utilized in the index of performance relating to this objective, is shown on page I-7-4.

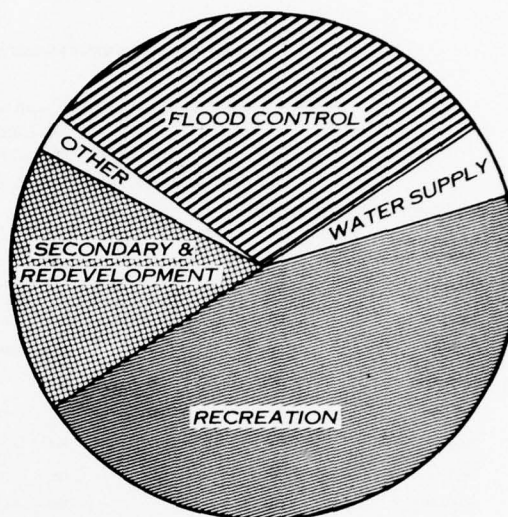
Total regional income expansion effects are estimated at \$578,413,000 annually from total costs of about \$179,498,000 annually. The overall ratio of regional expansion benefits to total costs is about 3.2 to one.

U.S. Department of Agriculture Programs

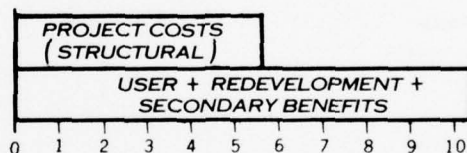
This report recommends 42 upstream watershed projects for early action under PL 566 authority. Benefits and costs for these watersheds are summarized in Table 7-2, (discounted at 3-1/4 percent interest) are evaluated on a 100-year economic life, and are presented graphically on this page. More detailed information is given in Appendix A.

Structural measures on State Forest Lands are recommended by the U.S. Department of Agriculture (USDA) at a cost of \$1,249,300 while structural measures in National Forests are estimated to cost \$535,735,000.

Land treatment measures proposed by the USDA are outlined in Appendix A. In accordance with priorities assigned by USDA, total costs are estimated at \$513,400,000 for the accelerated measures to be undertaken on private and public lands. A graphic presentation is given on page I-7-8. Annual benefits estimated by USDA are \$43,985,600 annually and regional income expansion benefits are estimated at \$80,005,000 annually.



**SOURCES OF NATIONAL INCOME
BENEFITS - USDA UPSTREAM WATERSHEDS
RECOMMENDED FOR EARLY ACTION**



ANNUAL COSTS & BENEFITS (\$1,000,000)

SOURCE: TABLE 7-2

The Forest Service of the U.S. Department of Agriculture recommends, in Appendix F, an accelerated program of recreation facility improvement and development within the National Forests of Appalachia. At current levels of funding, approximately \$30 million could be anticipated for recreation development within Appalachia for the next 10-year period. Under the accelerated program recommendation, \$360,314,900 is needed to meet the demand, for a total in excess of \$390 million. Benefits from the expanded use of recreational facilities are estimated at 18 million visitor days and the Forest Service estimates additional income benefits of \$120 million annually to Appalachia.

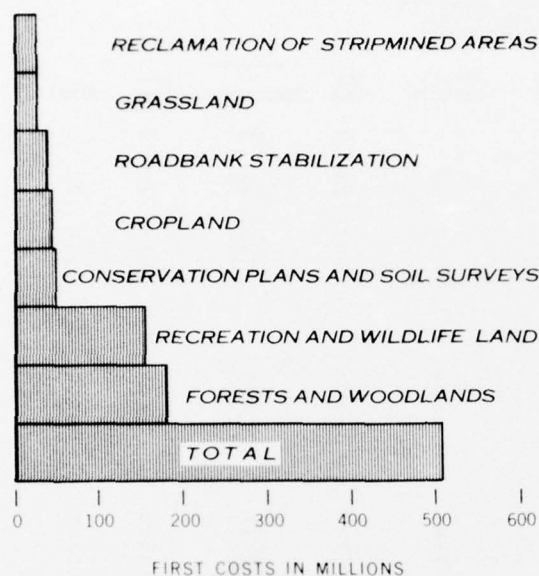
TABLE 7-2
SUMMARY OF ANNUAL BENEFITS & CHARGES (\$1,000)
USDA UPSTREAM WATERSHED STRUCTURAL
MEASURES RECOMMENDED FOR EARLY ACTION

State/Project	Flood Control	Water Quality	Water Supply MAI	Irrigation	Recreation Gen & FWL	Secondary & Redevelopment	Total Benefits	Construction Costs of Structural Measures	Annual Charges	B/C Ratio
Alabama										
Luxapilla Creek	126	-	16	-	36	70	248	4,843.9	190	1.3
Georgia										
Wahoo-Little River	22	-	1	-	3	6	32	566.9	25	1.3
Headwaters Chatahoo River	98	-	33	-	38	31	200	3,780.4	154	1.3
Kentucky										
Triplet Creek	35	-	-	-	30	33	98	3,720.6	70	1.4
Salt Lick Creek	34	-	-	-	9	15	58	773.3	45	1.3
Russell Creek	30	-	5	-	60	35	130	3,344.0	130	1.0
Maryland										
Upper Caselman River	(See Pennsylvania)									
Mississippi										
New York										
Mill Brook	14	-	-	-	12	6	32	415.0	17	1.8
Cayuga Inlet	85	-	-	-	21	26	132	2,078.0	73	1.8
Great Valley	77	-	-	-	-	22	99	2,791.1	98	1.0
Little Valley	8	-	-	-	10	4	22	552.4	18	1.2
Brokenstraw Creek	(See Pennsylvania)									
Upper French Creek	(See Pennsylvania)									
North Carolina										
Ohio										
Federal Valley Creek */	64	-	2	-	155	72	293	3,192.9	133	2.2
Little Salt Creek */	70	-	-	-	9	58	147	3,269.3	122	1.2
Upper Whiteoak Creek	43	-	-	-	123	41	207	2,782.0	115	1.8
Sugar Creek	75	-	10	-	20	10	115	2,500.0	85	1.4
Sunday Creek	60	-	20	-	100	20	200	4,900.0	166	1.2
Miller Run	75	-	-	-	10	30	115	1,000.0	34	3.0
Pennsylvania										
Upper Caselman River	135	-	20	-	112	40	307	1,979.1	67	4.6
Stony Creek */	182	-	-	-	180	124	486	7,851.2	373	1.3
Jacobs Creek	226	-	-	-	72	48	346	3,823.4	157	2.2
Brokenstraw Creek	40	-	-	-	713	113	866	5,787.7	300	2.9
Upper French Creek */	14	-	56	-	945	181	1,196	8,009.1	427	2.8
Wills Creek */	74	-	3	-	283	87	447	5,121.1	213	2.1
Blacklick Creek */	10	-	-	-	189	67	266	5,085.7	222	1.2
Conquenessing Creek */	229	-	110	-	599	202	1,140	14,637.3	600	1.9
Sewickley Creek */	260	-	18	-	-	65	343	3,528.8	164	2.1
South Carolina										
Cherokee Creek	4	-	12	-	16	4	36	370.5	13	2.8
South Pawnee River	27	-	26	5	124	45	227	2,359.1	126	1.8
Eighteen Mile Creek	29	-	5	-	80	28	142	1,734.2	89	1.6
Ooleny River	100	-	-	-	82	47	229	2,404.0	109	2.1
Tennessee										
Salt Lick Creek	58	-	15	-	50	34	157	2,908.1	121	1.3
Virginia										
Headwaters Holston River	42	-	35	-	309	86	472	5,326.0	224	2.1
Upper Bluestone River	143	30 **	-	-	12	31	216	2,580.9	86	2.5
Upper Clinch River	48	-	15	-	1	16	80	2,540.9	53	1.5
West Virginia										
Upper Buckhannon River */	64	-	-	-	69	50	183	4,839.6	166	1.1
Elk Creek */	136	-	-	-	113	45	294	4,142.9	147	2.0
Simpson Creek */	67	-	11	-	25	25	128	2,618.7	92	1.4
Three Fork Creek */	64	-	-	-	69	33	166	2,515.6	92	1.8
Limestone Run */	15	-	-	-	52	13	80	890.7	44	1.8
Prickett Creek */	13	-	-	-	29	6	48	700.4	28	1.9
Spring Creek	12	-	16	-	-	7	35	647.0	27	1.3
Kings Creek */	25	-	-	-	55	13	93	1,194.5	46	2.0
Upper Middle Island Creek */	98	-	-	-	51	59	208	4,124.4	173	1.2
TOTAL	3,031	30	429	5	4,876	1,948	10,319	138,320.9	5,634	1.8

*/ Denotes watersheds recommended for authorization for work plan preparation.

** Possible use - if USDA does not have authority to store water at time of final design, water quality storage will be dropped from plan.

LAND TREATMENT ACTIVITIES

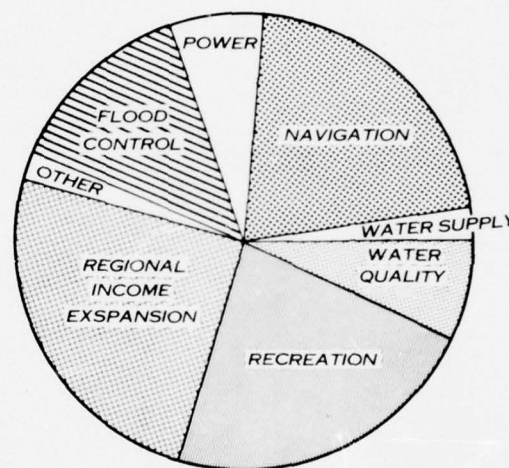


7. COST ALLOCATIONS

Cost allocations are made for multiple purpose projects to define direct costs attributable to each purpose, and to distribute joint costs by a systematic procedure. Results provide a basis for equitable cost sharing.

For multiple purpose reservoir projects evaluated by the Corps of Engineers and Tennessee Valley Authority, the Separable Cost-Remaining Benefits (SCRB) method is utilized as appropriate to the project mix to distribute costs among the purposes of flood control, water supply, water quality control, hydroelectric power, irrigation, recreation, and regional income expansion. Introduction of regional income expansion allows explicit and consistent distribution of costs in consonance with the major objective of this survey. The procedure for determining direct costs of each purpose is by the method of computing the reduction in total cost of the multiple purpose project with that purpose deleted. Residual costs, remaining after direct (separable) costs, are distributed according to the ratio of benefits remaining to each purpose. In consonance with

the SCR method, benefits are limited by the cost of the most efficient alternative means for accomplishing each purpose. Since a complete array of alternative means for attaining equivalent gains in regional income is not available, but each project was formulated to provide the array of water services at least costs, project costs were utilized for the limit on regional income expansion, since a properly formulated project is, by definition, the least costly means for attaining the desired objective.



ALLOCATED COSTS
MAJOR PROJECT PROPOSALS

In most cases, multiple purpose project costs for structures evaluated by the Soil Conservation Service of the U.S. Department of Agriculture are allocated to flood control, water supply, and recreation purposes by the Use of Facilities method. Direct costs are those features physically identifiable and utilized exclusively by one purpose. Joint-use costs (the residual costs) are distributed in the ratio of storage allocated to each purpose. However, for the 16 watersheds needing special authorization for preparation of work plans, costs will be allocated by the SCR method, including allocation to regional income.

Cost allocations were not made for those projects serving only one user purpose, since a distribution would not affect cost sharing procedures or serve administrative criteria.

TABLE 7-3
SUMMARY OF ALLOCATED PROJECT CONSTRUCTION COSTS (\$1,000) ^{1/}
MAJOR PROJECT RECOMMENDATIONS IN AWRs

	Flood Control	Power	Navigation	Water Supply MAI	Irrigation	Environmental Enhancement Water Quality	Recreation	Other	Regional Expansion	Total
<u>Corps of Engineers Reservoirs for Authorization</u>										
Royalton Reservoir - Salisbury Area ^{2/}	11,905	-	-	481	-	816	3,326	1,773 ^{3/}	27,204	45,505
Royal Glen	7,726	-	-	-	-	-	6,942	-	14,412	29,080
Hipes ^{4/}	1,390	-	-	-	-	6,115	10,853	-	5,189	23,547
Clutchfield	1,270	-	-	7,940	-	1,953	36,486	-	10,916	58,565
Roaring River	1,687	-	-	776	-	1,765	1,604	-	4,926	10,758
Curry Creek	2,729	-	-	2,198	-	-	8,091	-	4,739	17,757
Dalton	6,024	-	-	1,353	-	3,077	15,516	-	18,330	44,300
Stannard	165	-	-	288	288	8,195	14,214	-	14,352	37,500
St. Petersburg	30,709	66,548	-	-	-	27,700	56,379	-	58,664	240,000
Whiteoak	3,990	-	-	3,346	-	1,929	19,047	-	11,719	40,031
Logan	3,187	-	-	2,090	-	608	21,576	2,126 ^{5/}	14,554	44,141
TOTAL	70,780	66,548	-	18,472	288	52,158	194,034	3,899	185,005	591,184
<u>Corps of Engineers Reservoir for Consideration</u>										
Lower Knox (3-1/4%)	18,088	-	-	-	-	9,091	3,556	-	18,465	49,200
<u>TVA Reservoirs</u>										
Upper French Broad System (3-1/4%)	32,600	-	-	3,500	-	10,600	6,900	5,400 ^{6/}	41,500	100,000
<u>State Projects</u>										
Otiscou (3-1/4%)	-	-	-	-	-	-	6,150	-	-	6,150
Naturealm (3-1/4%)	-	-	-	-	-	-	13,580	-	-	13,580
<u>Corps of Engineers Local Protection Projects for Authorization</u>										
Tamaqua	2,355	-	-	-	-	-	-	-	-	2,355
Midland	8,230	-	-	-	-	-	-	-	-	8,230
<u>Corps of Engineers - Economic Restudy</u>										
Coosa River Navigation (3-1/4%)	-	-	209,965	-	-	-	-	-	-	209,965
<u>Tennessee Valley Authority</u>										
Yellow Creek Port	-	-	628	-	-	-	-	-	6,409	7,037
TOTAL	132,053	66,548	210,593	21,972	288	71,849	223,720	9,299	251,379	987,701

^{1/} At 4-7/8 percent interest unless noted.

^{2/} Elements 1, 2, 3 and 4.

^{3/} Accelerated Land Treatment.

^{4/} Include downstream fishery and trout rearing station.

^{5/} Nature Area.

^{6/} Including \$4,900 for Shoreline Development.

TABLE 7-4
SUMMARY OF ANNUAL ALLOCATED PROJECT FINANCIAL COSTS (\$1,000)
MAJOR PROJECTS RECOMMENDED IN AWRS 1/

	Flood Control	Power	Navigation	Water Supply M&I	Irrigation	Environmental Water Quality	Enhancement Recreation	Other	Regional Expansion	Total
<u>Corps of Engineers Reservoirs for Authorization</u>										
Royalton Reservoir -										
Saliersville Area 2/	633	-	-	26	-	45	211	-	1,506	2,421
Royal Glen	438	-	-	-	-	-	413	-	828	1,679
Hipes	78	-	-	-	-	346	786	-	311	1,521
Clinchfield	90	-	-	558	-	97	1,547	-	559	2,851
Roaring River	93	-	-	45	-	108	111	-	279	636
Curry Creek	157	-	-	139	-	-	336	-	314	946
Dalton	329	-	-	76	-	174	985	-	1,055	2,619
Stannard	9	-	-	16	16	458	849	-	802	2,150
St. Petersburg	1,745	6,178	-	-	-	1,531	3,673	-	3,468	16,595
Whiteoak	226	-	-	184	-	112	1,317	-	665	2,504
Logan	186	-	-	114	-	39	1,509	217	820	2,885
TOTAL	3,984	6,178	-	1,158	16	2,910	11,737	217	10,607	36,807
<u>Corps of Engineers Reservoir for Consideration</u>										
Lower Knox (3-1/4%)	670	-	-	-	-	344	163	-	688	1,865
<u>TVA Reservoirs</u>										
Upper French Broad (3-1/4%)	1,237	-	-	124	-	376	225	190	1,466	3,618
<u>State Projects</u>										
Otocsin (3-1/4%)	-	-	-	-	-	-	1,098	-	-	1,098
Naturealm (3-1/4%)	-	-	-	-	-	-	1,325	-	-	1,325
<u>Corps of Engineers Local Protection Projects</u>										
Tamaqua	118	-	-	-	-	-	-	-	-	118
Midland	168	-	-	-	-	-	-	-	-	168
<u>Corps of Engineers - Economic Restudy</u>										
Coosa River Navigation (3-1/4%)	-	-	10,264	-	-	-	-	-	-	10,264
<u>Tennessee Valley Authority</u>										
Yellow Creek Port	-	-	46	-	-	-	-	-	473	519
TOTAL	6,177	6,178	10,310	1,282	16	3,630	14,548	407	13,234	55,782

1/ At 4-7/8 percent interest unless otherwise noted.

2/ Elements 1, 2 and 3.

TABLE 7-5
SUMMARY OF ALLOCATED CONSTRUCTION COSTS (\$1,000)
USDA UPSTREAM WATERSHED STRUCTURAL
MEASURES RECOMMENDED FOR EARLY ACTION

	Flood Control	Water Quality	Water Supply M&I	Irrigation	Recreation Gen. & FWL	Construction Costs of Structural Measures
Alabama						
Luxapilla Creek	4,188.4	-	241.8	-	413.7	4,843.9
Georgia						
Wahoo-Little River	557.0	-	9.9	-	-	566.9
Headwaters Chatooga River	2,964.0	-	565.2	-	251.2	3,780.4
Kentucky						
Triplett Creek	3,399.5	-	-	-	321.1	3,720.6
Salt Lick Creek	747.1	-	-	-	26.2	773.3
Russell Creek	2,573.6	-	53.2	-	717.2	3,344.0
Maryland						
Upper Casselman River	(See Pennsylvania)					
Mississippi						
New York						
Mill Brook	237.4	-	-	-	177.6	415.0
Cayuga Inlet	2,078.0	-	-	-	-	2,078.0
Great Valley	2,791.1	-	-	-	-	2,791.1
Little Valley	303.8	-	-	-	248.6	552.4
Brokenstraw Creek	(See Pennsylvania)					
Upper French Creek	(See Pennsylvania)					
North Carolina						
Ohio						
Federal Valley Creek */	2,274.2	-	30.7	-	888.0	3,192.9
Little Salt Creek */	2,849.7	-	-	-	419.6	3,269.3
Upper Whiteoak Creek	1,362.0	-	-	-	1,420.0	2,782.0
Sugar Creek	1,100.0	-	300.0	-	1,100.0	2,500.0
Sunday Creek	2,210.0	-	590.0	-	2,100.0	4,900.0
Miller Run	410.0	-	-	-	590.0	1,000.0
Pennsylvania						
Upper Casselman River	560.1	-	580.9	-	838.1	1,979.1
Stony Creek */	4,697.5	-	-	-	3,153.7	7,851.2
Jacobs Creek	3,049.8	-	-	-	773.6	3,823.4
Brokenstraw Creek	2,405.5	-	-	-	3,382.2	5,787.7
Upper French Creek */	2,278.2	-	1,434.5	-	4,386.6	8,099.3
Wills Creek */	1,974.1	-	89.5	-	3,057.5	5,121.1
Blacklick Creek */	2,193.0	-	-	-	2,892.7	5,085.7
Connquenessing Creek */	7,011.8	-	2,938.3	-	4,687.2	14,637.3
Sewickley Creek */	3,177.7	-	351.1	-	-	3,528.8
South Carolina						
Cherokee Creek	196.1	-	174.4	-	-	370.5
South Pacolet River	903.4	-	517.3	122.0	816.4	2,359.1
Eighteen Mile Creek	1,086.3	-	76.3	-	571.6	1,734.2
Oolenoy River	1,843.2	-	-	-	560.8	2,404.0
Tennessee						
Salt Lick Creek	1,965.5	-	273.6	-	669.0	2,908.1
Virginia						
Headwaters Holston River	2,840.5	-	734.8	-	1,750.7	5,326.0
Upper Bluestone River	2,294.3	286.6 **/	-	-	-	2,580.9
Upper Clinch River	2,481.0	-	59.9	-	-	2,540.9
West Virginia						
Upper Buckhannon River */	4,417.3	-	-	-	422.3	4,839.6
Elk Creek */	3,701.9	-	-	-	441.0	4,142.9
Simpson Creek */	1,980.0	-	232.2	-	406.5	2,618.7
Three Fork Creek */	2,139.8	-	-	-	375.8	2,515.6
Limestone Run */	230.9	-	-	-	659.8	890.7
Prickett Creek */	549.1	-	-	-	151.3	700.4
Spring Creek	138.4	-	508.6	-	-	647.0
Kings Creek */	762.8	-	-	-	431.7	1,194.5
Upper Middle Island Creek */	3,707.2	-	-	-	417.2	4,124.4
TOTAL	88,631.2	286.6	9,762.2	122.0	39,518.9	138,320.9

*/ Denotes watersheds recommended for authorization for work plan preparation.

**/ Possible use - if USDA does not have authority to store water at time of final design, water quality storage will be dropped from plan.

A summary of allocated construction costs of major project proposals is presented in Table 7-3. The balance of costs between purposes is illustrated by the graphic on page I-7-8.

A summary of allocated annual costs, being construction, plus operations, maintenance and replacement, is presented in Table 7-4.

A summary of allocated construction costs for structural measures of USDA Upstream Watershed Projects recommended for early action is given in Table 7-5.

CHAPTER 8 - RESPONSIBILITIES AND PLAN IMPLEMENTATION

1. POLICIES AS TO FEDERAL PARTICIPATION

The responsibilities for plan implementation are divided between Federal and non-Federal interests, between State and local interests, and between private and public interests. Successful implementation of this plan will require a clear understanding of the obligations of each group of interests, and close collaboration between all interests to produce coordinated and cooperative actions.

One of the important divisions of responsibility between various interests is for financial participation. Cost sharing for various purposes has evolved over the years for major water, and some other, resource projects. A hierarchy of interest by the Federal government is evident as the effects of water resource investments purposes move from widespread benefits to becoming more localized. Thus, for flood control and navigation projects providing widespread, usually interstate, impacts, a high degree of Federal participation in financing construction and operation is set by statute. Reclamation law has established a high degree of Federal interest in providing irrigation water to the western States, and has used power revenues to help finance reclamation projects. Therefore, flood control, navigation, irrigation, and occasionally power, can be considered as "prime movers" of eligibility for a considerable degree of Federal financial participation in project construction and operation. The clear emphasis on regional economic development in PL 89-4 would place this purpose also in the category of high Federal participation in financing public works programs.

Federal water resource projects, primarily reservoir projects built for other purposes, have become a highly significant source of recreation opportunities for urban and rural residents. Since unimpeded public access is maintained at most Federal projects, the heavy use by recreationists has led to large expenditures for public use facilities and for operation and maintenance measures. At present, public policy is for non-Federal financing of 50 percent of separable

construction costs of new recreation facilities and lands, and complete operation and maintenance by non-Federal interests.

Storage for municipal and industrial water supply can be added to Federal reservoirs with all allocated costs, with interest, reimbursed by non-Federal interests. As a matter of interest, reclamation laws provide for reimbursement of allocated costs for irrigation water storage without interest charges. This amounts to repayment of about one-half of total costs, including interest, if payments are deferred. In the Stannard Reservoir, where it is proposed to store irrigation water, 50 percent cost sharing is similarly advocated.

Conventional hydroelectric power can be installed in Federal water resource projects with complete reimbursement of allocated construction and operation costs. A summary of reimbursement policies and legislative precedent is set forth in Table 8-1.

2. COST SHARING (APPORTIONMENT)

In view of applicable law and policy, the costs of various proposals, recommended in this report, have been divided between Federal and non-Federal interests. One of the important additions to water resource evaluation procedures by this report is the emphasis on estimating the costs of associated private and public investments which would be required to attain the anticipated regional employment levels induced by or stemming from water resources development. Federal participation in the associated development is much more limited than for water resources development, and is primarily by grant-in-aid programs. State and local governments are therefore the primary sources of revenues for most of the public sector's share of the associated development costs.

Successful development of the Appalachian Region will require massive injections of private investment. If the public services provided by Federal and non-Federal sources is supplied in a manner which increases

TABLE 8-1
COST SHARING POLICY FOR FEDERAL WATER RESOURCE DEVELOPMENT

Item	Non-Federal Costs	Legislative Precedent
Flood Control		
Reservoirs (widespread effects)	None	Flood Control Act of 1938
Local Flood Protection	Furnish lands, rights-of-way & relocations, hold the Government free from damages; operate & maintain project.	Flood Control Act of 1936, as amended.
Soil Conservation Service	Furnish lands, rights-of-way & relocations; operate & maintain project.	PL 83-566, as amended.
Navigation		
Waterway Improvement	Various; present policy to provide dock facilities, some bridge and utilities relocations, and lands and rights-of-way.	Sec I, River & Harbor Act of 1920.
Port (commercial)	Provide dock and associated facilities.	Authorizing Legislation.
Small Boat Harbors	Provide access and docking facilities; and contribute 50 percent costs allocated to recreation boating.	Authorizing Legislation.
Conventional and Pumped Storage Hydropower	Complete repayment of construction, operation and maintenance costs allocated to power.	Flood Control Act of 1944.
General Recreation & Fish & Wildlife Enhancement	50 percent of separable costs; operate & maintain all facilities.	Flood Control Act of 1944; Federal Water Project Recreation Act (PL 89-72).
Water Supply		
Municipal & Industrial	Complete repayment of allocated costs, with interest	Water Supply Act of 1958 (PL 85-500).
Irrigation	Repayments vary; no interest charged; system approximates 50 percent cost sharing	Reclamation Laws & USDA policy for irrigation water.
Water Quality Control (flow augmentation)	None, when benefits are widespread.	Water Pollution Control Act (PL 84-660) as amended.
Regional Income Expansion	As proposed in this report, all of associated costs, except for grant-in-aid assistance; none of project costs allocated to regional income expansion.	Appalachian Regional Development Act of 1965 (PL 89-4).

the number of profitable opportunities for private investment, the goals of PL 89-4 will be met. This survey has estimated the levels of private investment required to attain the regional development benefits attributed to each project.

A graphic description of the division of total costs between Federal and non-Federal interests is presented on page I-8-4, along with the division by purposes.

The division of costs reflects current cost sharing law and policy. In common with other areas of public policy, cost sharing policy is not static and the division of costs is not completely concurred with by the states. For example, the Commonwealth of Pennsylvania takes exception to the normal 50 percent cost sharing for recreation in St. Petersburg Reservoir, because, in the Commonwealth's opinion, the project would service a large interstate population. Thus, it is argued that since recreation services provided by the project are widespread and national in scope, normal cost sharing results in the imposition of a heavy burden on the financial resources of the park system within the state. The interstate residence of potential users of the Lower Knox Reservoir project imposes a similar problem on the Commonwealth of Kentucky.

Table 8-2 presents a summary of apportioned construction costs for the major project proposals recommended in the survey.

Table 8-3 presents a summary of apportioned annual operation, maintenance and replacement costs. The apportionment of structural, and operation and maintenance costs, for the 42 upstream watershed projects recommended for early action will be computed at the time work plans are developed; apportionments will be consistent with the criteria and principles of PL 83-566 and PL 89-4.

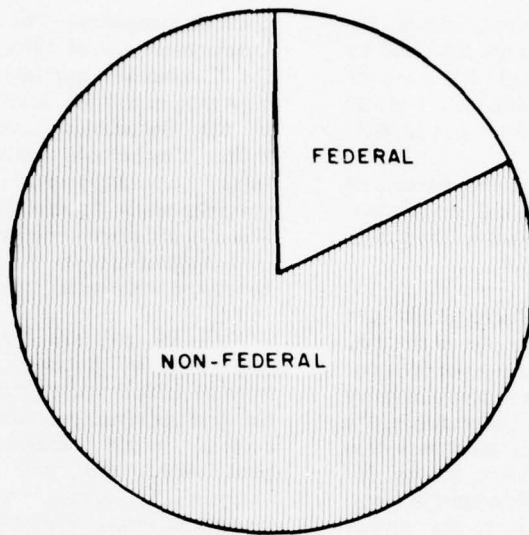
3. RESPONSIBILITIES OF STATE AND LOCAL GOVERNMENT

Additional emphasis has been placed in this report on the role of state and local governmental action in setting priorities and moving water resource and associated investment

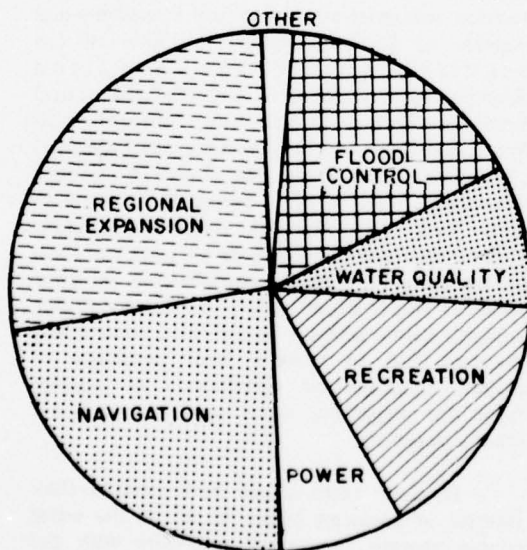
plans to completion. The Appalachian Regional Development Act of 1965 (PL 89-4) formulated the Commission approach to accomplish the objectives of the Act. Joint Federal-State staffing of the Commission, co-equal status of the Federal Co-chairman and the State Co-chairman imply an expanded role for the state governments in Appalachia. Composition of the WDCCA introduced representatives of each state with representatives of the Federal agencies concerned with water resources development.

Each project report (in Part III) emphasizes the dominant role that non-Federal interests (public and private) must play to attain the developmental potential of each area. In this context, certain additional requirements have been added, over and above the financial responsibilities, to specific project recommendations. Where land use controls and land development are required to attain the expected developmental benefits, project recommendations include a provision that the Secretary of the Army (in consultation with the Secretary of Agriculture in the joint Salyersville project) determine that the institutional capability to control land use and to acquire and develop industrial and other land is available and capable of being activated. Examples of the requirement are the Royalton Reservoir-Salyersville Area and Midlands Local Protection Projects in Kentucky, Tamaqua Local Protection Project in Pennsylvania, developmental possibilities below Royal Glen Reservoir in South Petersburg, West Virginia, Stannard Reservoir in New York, and Whiteoak Reservoir in Ohio. Other requirements are placed on state and local governments to prevent encroachment on river channels which would reduce the flood carrying capacity below projects having flood control as a purpose, and to exercise their capability to prevent unauthorized withdrawals of releases made for irrigation, water supply, and water quality purposes.

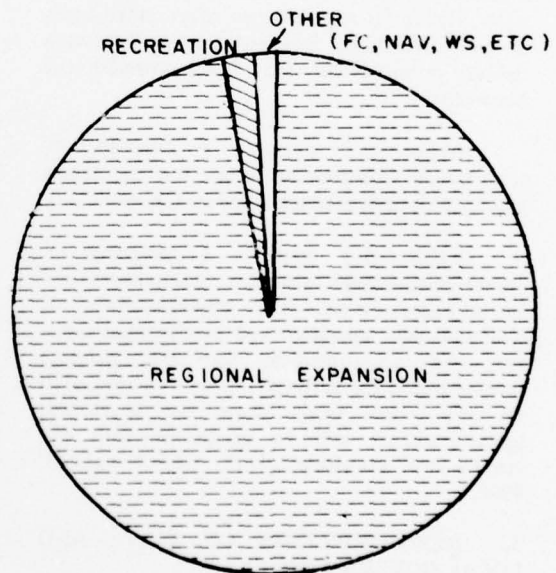
In some cases, states have asserted their interest in acquiring rights to all of the water supply storage in certain reservoirs with the intent to contract with municipal and other water using interests for repayment of costs. As withdrawals from streams for competing uses increase, and when disposal of effluents bring conflicts, additional pressure on each state's



**COST SHARING
TOTAL COSTS**



**FEDERAL SHARE
OF
TOTAL COSTS**



**NON-FEDERAL SHARE
OF
TOTAL COSTS**

TABLE 8-2
SUMMARY OF APPORTIONED CONSTRUCTION COSTS (\$1,000)
MAJOR PROJECTS RECOMMENDED IN AWRIS 1

	FEDERAL COSTS										NON-FEDERAL COSTS										Total Water Project Costs
	Flood Control	Other	Water Quality	Recrea- tion	Power	Nav- igation	Water Supply (Util.)	Regional Income Exp.	Total	Flood Control	Other	Recrea- tion	Nav- igation	Water Supply M&I	Land Treat- ment	Regional Income Exp.	Total	Total Federal & Non-Federal Costs			
Corps of Engineers Reservoir Projects for Authorization																					
Reservoir Area -																					
Salmon River Area 2)	10,398	1,440	816	1,942	-	-	-	38,204	52,980	1,507	-	1,384	-	481	333	245,500	249,205	302,105	45,505		
Royal Glen	7,676	-	-	6,942	-	-	-	14,412	29,030	50	-	-	-	-	-	178,596	178,596	207,376	29,776		
Hopewell	1,390	-	6,115	10,244	-	-	-	5,189	22,038	-	-	509	-	-	-	1,680	2,190	25,177	23,547		
Chinlefield	1,270	-	1,801	21,531	-	-	-	9,950	34,552	-	-	14,064	-	9,449	-	555,147	579,160	613,712	58,565		
Running River	1,687	-	1,385	3,146	-	-	-	4,926	9,524	-	-	458	-	776	-	93,426	94,660	104,184	10,518		
Curry Creek	2,729	-	1,077	11,666	-	-	-	4,739	11,530	-	-	4,029	-	2,198	-	8,750	14,977	26,507	17,757		
Dillon	6,024	-	1,666	-	-	-	-	18,330	39,067	-	-	3,450	-	1,353	-	883,499	888,702	927,799	44,300		
Stannard	163	-	8,195	8,514	-	-	144	14,352	31,368	-	144	5,700	-	286	-	20,200	26,332	57,700	37,500		
Shoshone	30,399	-	27,000	42,479	-	-	-	58,664	128,100	-	-	13,900	-	-	-	591,448	605,348	831,648	240,000		
Whitcomb	3,396	-	1,978	11,474	-	-	-	11,174	26,340	-	-	8,444	-	3,147	-	445,577	457,368	483,608	40,031		
Logan	3,187	1,863	698	11,458	-	-	-	14,534	30,870	-	1,863	10,116	-	2,090	-	84,179	97,468	128,334	56,411		
TOTAL	69,222	2,503	52,006	130,687	66,548	-	144	195,139	516,249	1,557	1,207	62,456	-	20,482	333	3,107,668	3,193,703	3,709,952	591,184		
Corps of Engineers Reservoir for Construction																					
Lower Knox (3-1-45)	18,288	-	9,081	2,864	-	-	-	18,465	48,508	-	-	692	-	-	-	872	1,564	50,072	49,200		
TVA Reservoirs																					
Upper French Broad System (3-1-45)	32,167	5,400	10,600	4,100	-	-	-	41,500	93,767	433	-	2,300	-	3,500	-	65,000	71,233	165,000	100,000		
State Projects																					
Oconomocot (3-1-45)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Norwauke (3-1-45)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Corps of Engineers Local Protection Projects																					
Tennessee Midland	2,279	-	-	-	-	-	-	-	2,279	76	-	-	-	-	-	5,200	5,276	7,555	2,555		
Tennessee Midland	7,564	-	-	-	-	-	-	-	32,064	666	-	-	-	-	-	363,500	364,166	396,230	8,230		
Corps of Engineers Economic Benefit																					
Coon River Navigation (3-1-45)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tennessee Valley Authority																					
Yellow Creek Port	129,220	7,903	71,697	137,651	66,548	198,102	144	284,326	895,691	2,732	1,207	85,178	12,491	23,982	333	3,834,446	3,960,369	4,836,060	987,702		
TOTAL	129,220	7,903	71,697	137,651	66,548	198,102	144	284,326	895,691	2,732	1,207	85,178	12,491	23,982	333	3,834,446	3,960,369	4,836,060	987,702		

1) At 4.75 percent interest rate unless noted.

2) Elements 1, 2, 3, 4, and 5.

3) Land Treatment.

4) Nature Area.

5) Including \$4,900,000 for Shoreline Development.

6) Irrigation.

7) Includes \$11,000,000 Costs of Elements 5 estimated Federal participation under grant-in-aid program, net Federal cost for water project (Elements 1, 2, 3, 4, 5) is \$41,800,000.

8) Includes \$34,500,000 costs of developmental plus estimated Federal participation under grant-in-aid program, net Federal cost for water project is \$7,564,000.

9) Hydro-power costs are completely reimbursable, net Federal costs are \$159,552,000.

TABLE B-3

SUMMARY OF APPORTIONED ANNUAL PROJECT OPERATION, MAINTENANCE AND MAJOR REPLACEMENT COSTS (\$1,000) ^{1/}
MAJOR PROJECTS RECOMMENDED IN AWRB

	FEDERAL COSTS								NON-FEDERAL COSTS						
	Flood Control	Power	Navigation	Irrigation	Water Quality	Recreation	Other	Regional Expansion	Total	Flood Control	MAI	Irrigation	Recreation	Other	Total
Corps of Engineers Reservoir Projects for Authorization															
Royalton Reservoir - Savoyville Area Project 2/	21.0	-	-	-	1.0	-	-	38.0	60.0	6.3	-	-	56.0	-	62.3
Royal Glen	9.5	-	-	-	-	91.0	-	32.0	132.5	2.5	-	-	-	-	2.5
Hipes	3.0	-	-	-	16.0	208.0	-	31.0	258.0	-	-	-	80.0	-	80.0
Cinchfield	23.0	-	-	-	2.0	15.0	-	34.0	74.0	-	33.0	-	580.0	-	613.0
Roaring River	6.0	-	-	-	17.0	5.0	-	22.0	50.0	-	5.0	-	39.0	-	44.0
Curry Creek	13.0	-	-	-	-	1.0	-	64.0	78.0	-	23.0	-	63.0	-	86.0
Dutton	4.0	-	-	-	8.0	20.0	-	66.0	98.0	-	3.0	-	292.0	-	295.0
Stannard	.3	-	-	-	15.7	5.5	-	27.5	49.0	-	0.5	0.5	90.0	-	91.0
St. Petersburg	51.0	2,507.0 3/	-	-	3.0	3.0	-	232.0	2,796.0 3/	-	-	-	560.0	-	560.0
Whiteoak	10.8	-	-	-	7.6	2.5	-	32.9	53.8	-	3.4	-	286.4	-	289.8
Logan	13.6	-	-	-	5.7	1.2	-	35.1	55.6	-	1.6	-	490.8	101.9 4/	594.3
TOTAL	155.2	2,507.0	-	-	76.0	352.2	-	614.5	3,704.9	8.8	69.5	0.5	2,537.2	101.9	2,717.9
Corps of Engineers Reservoir for Consideration															
Lower Knox (3-1/4%)	16.7	-	-	-	15.7	2.5	-	22.3	57.2	-	-	-	32.5	-	32.5
TVA Reservoirs															
Upper French Broad (3-1/4)	93.8	-	-	-	9.3	3.3	6.6	31.4	144.4	14.6	-	-	150.0	-	164.6
State Projects															
Otsein (3-1/4%)	-	-	-	-	-	-	-	-	-	-	-	-	676.0	-	676.0
Naturain (3-1/4%)	-	-	-	-	-	-	-	-	-	-	-	-	567.0	-	567.0
Corps of Engineers Local Protection Projects															
Tamiqua	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	2.0
Midland	-	-	-	-	-	-	-	-	-	85.7	-	-	-	-	85.7
Corps of Engineers - Economic Restudy															
Cocoa River Navigation (3-1/4%)	-	-	707.0	-	-	-	-	-	707.0	-	-	-	-	49.0 5/	49.0
Tennessee Valley Authority															
Yellow Creek Port	-	-	-	-	-	-	-	-	-	-	-	-	-	20.7 5/	20.7 5/
TOTAL	265.7	2,507.0	707.0	-	101.0	358.0	6.6	668.2	4,613.5	111.1	69.5	0.5	3,962.7	171.6	4,315.4

^{1/} At 4-7/8 percent interest unless noted.

^{2/} Elements 1, 2 & 3.

^{3/} Subject to complete reimbursement, therefore, net Federal OMBR is \$289,000 annually.

^{4/} Nature area.

^{5/} Navigation.

water law can be expected. Plans for inter- and intra-basin and inter- and intra-state diversions will accelerate as water use exceeds natural streamflows. Many Appalachian states have experienced few conflicts in water use and, thus, have limited case law precedents.

These are some of the more important responsibilities of state and local government. The division of responsibilities between each will be resolved by the participants in a manner

acceptable to each interest and reflecting the capabilities and desires of each level of government. Clearly, aggressive, forceful and coordinated action by each level of government is required if the goals of PL 89-4 are to be attained. As discussed in Chapter 3, a key element in producing change and creating a favorable economic environment lies in the attitudes of the entire local community in which potentials for change have been found.

CHAPTER 9 - VIEWS OF THE APPALACHIAN STATES*

1. INTRODUCTION

The States recognize that this report has been an ambitious undertaking, and that its conduct has opened the way to greater opportunity than can be completely determined or defined within its limits. Therefore, the States want to provide a contingency for further consideration of water resource development to be evolved after this report has been published.

The water resources survey authorized by Section 206 of PL 89-4 called for the institution of new sets of arrangements between the federal and state offices and agencies concerned with water resources and economic development. The principal new element was the creation of the Appalachian Regional Commission, directed to prepare regional plans with which the water survey effort was to be integral and harmonious. Within the States, new or reorganized offices came into being to manage the Appalachian Program. Relationships between these offices and others more usually concerned with comprehensive water investigations necessarily had to evolve. At the local level, PL 89-4 called for setting up Local Development Districts, to plan on a multi-county basis to meet all developmental needs, including water resources needs, as related to comprehensive development plans.

To facilitate the inter-relationships and special activities involved in the preparation of the water resources report, the Water Development Coordinating Committee for Appalachia (WDCCA) was established, to which the States appointed members and alternates. State planning for economic development produced determinations of present and potential water needs which, as explained in Chapter 5, had an iterative effect on the delineation of growth potentials.

A major innovation in this report is the thirteen State Water Supplements (Volumes 13

and 14), in which each State has described its water resource management and development programs. Many of the Supplements present needs, projects and priorities, as seen by the States. Another major value of the decision by the States to prepare the Supplements was that, in several States, new institutional forms were created to accomplish the task, and these have been continued into State-wide mechanisms for water and related planning.

The States participated, through the nine WDCCA meetings and in the project screening sessions, in a review of all aspects of report preparation and project development. As the sub-regional plans were prepared, the States contributed data and facts which have greatly increased their validity and utility. Working through the Appalachian Regional Commission, these activities will continue, as this report is reviewed by the Governors and others.

The preparation of this chapter of the summary report volume also reflects the active State participation in this survey. During the final review phase of the report, the States met and reached several points of consensus concerning the survey, and subsequently provided additional comments to the staff of the States' Regional Representative to the Commission. The statement of consensus and written comments from the States provided the basis for preparing this chapter. Specific comments on the projects proposed in this report are included in Part III of this report, that portion concerned with the individual projects.

2. SCOPE OF APPALACHIAN WATER SURVEY

The scope of the water resources development survey was patterned after the normal inter-agency survey procedures for comprehensive studies of river basins, with the following several significant exceptions.

* This chapter was prepared from inputs by the WDCCA members from the 13 Appalachian States. The views expressed do not necessarily represent those of the Corps of Engineers and the other participating Federal agencies.

Adjustments were made in the general survey procedures to accommodate areas defined by the regional boundaries which cut across major river basins, and to accomplish plan development within a shorter time period than usually provided for comprehensive river basin surveys.

The most important adjustment was the further refinement of the economic and social evaluation procedures used to assess the various projects selected by the Corps for analysis and alternative options within the formulation of each such project. The evaluation procedures were modified in order to allow better estimates to be made of the economic development impacts of each type, mix, and scale of water resource investments. These procedures not only provided better estimates of increases in income and employment resulting after the water resource investments; but also necessitated including in the development plan estimates of other types of public investments needed to support such growth, as well as levels of private investment necessary to provide employment opportunities.

The development of these evaluation procedures and their application to a pilot study in the Upper Licking River, at Salyersville, Kentucky led to the realization that either new or strengthened institutional arrangements would be needed at and between the State and local levels of government in order to assure accomplishment of the related activities necessary to realize anticipated development benefits associated with the water resource investments.

It was also recognized that the plan developed and recommended would not be a total master plan of the Region's water resources, but rather a significant step in identifying a set of projects which would fit into the existing economic development plans of the States. A master plan of water development was not possible since existing and on-going river basin studies (e.g., Kanawha, Potomac and Susquehanna) would in themselves provide for a more detailed consideration of development within the river basin context, even though these would not be geared to economic development to the same degree.

However, the existence of these efforts provided the basis for assurance that the projects considered, developed and recommended in this report are an integral part of the orderly, necessary and economically feasible water development in these basins - - and, thus, in the region.

In addition, it has become apparent that the extensive data compiled in the report appendices will be a valuable reference for the States in many concerns not directly related to water resources development, and will provide valuable sources of information in the formulation of state-wide water plans.

3. CONSENSUS REACHED BY STATES

During the final review of this survey report, the following principal points of consensus were reached by the State members of the Coordinating Committee:

a. *Acceleration*

The States want to provide concurrence for accelerated considerations of those projects recommended which are justified in terms of the current report, and are given concurrence by the Appalachian Regional Commission. Other project considerations will be dealt with by the States and the Commission in continuing activity.

b. *Further Project Consideration*

The States wish to continue activities, with Federal agency cooperation, for a limited time beyond the publication of this report, to give consideration to projects not given full concurrence under "a" above. Such considerations may apply to the following as well as being included in the planning of the Commission's report which will accompany this report when transmitted to the President and Congress:

(1) Projects to be considered under existing water development terms and practice;

(2) Projects to be considered under water development terms and practice yet to evolve; and

(3) New projects, if any, which may evolve as a result of new or innovative considerations resulting from this activity.

c. Further Policy or Procedural Considerations

The States wish to continue activities, as with projects in "b" above, to give further consideration to the practical impact upon states and water development of policy or procedural considerations included in the report, and upon further policy or procedural considerations which may not be included in the report.

In this process, the States would relate such considerations to evolving state water planning; National Water Commission policy studies; and state and area development plans, all of which are moving forward more effectively at this time because of the States' experiences in working with preparation of this report and with the Appalachian program.

d. Continuation

During the limited time of carry-over activity, referred to in "b" and "c" above, the States will give consideration to design and recommendation for establishment of an institutional arrangement through the Appalachian Regional Commission to provide for a continuity of considerations growing out of the report over the next few years. The work to be accomplished in such continuity of effort would relate to the growing ability of the States to conduct state water resources planning, to complete initial comprehensive water resource plans, and to formulate interstate relationships in water planning, as well as to help provide for more effective "developmental criteria" by relating water planning to evolving comprehensive area and state development planning.

In the near future a continuation of such States' efforts, in conjunction with appropriate Federal agencies, can attain practical application of the key Appalachian program concepts of relating water resources developments to the needs evolving from comprehensive area development programming.

The Appalachian Water Study has created an opportunity to use water resource development in conjunction with other measures to foster regional growth and prosperity. The broad outline of the many project measures that can be employed is beginning to be evident. However, the study to this point has not completely brought into play the local cooperation that will be required later, nor has State planning been addressed in detail to the resolution of all the items that will be necessary before "dirt can fly". This is not a criticism so much as it is a statement that much remains to be done to support the Federal recommendations. It is of the utmost importance that the planning process now be expanded to include major local participation as one of the key goals.

The State WDCCA members believe that the objective and contingencies expressed in this statement should be included in the text of the current report as elements which could well have been treated in the report, but which must involve considerations and expressions which go beyond those that are possible within the time limits and other constraints affecting its preparation.

Obviously concurrences in this report are contingent upon existing legislation and financial capabilities of the States at the time definite commitments are required. In addition, it is expected that the plan will be expanded as a result of inputs from on-going state and federal studies.

4. SUMMARY OF STATES' VIEWS

The Appalachian Program, as conceived, recognized that in this area of the country new organizations and innovative procedures would be required to improve the general economy of the area and the well-being of its people. It should be noted that the innovations being tested in the Appalachian "laboratory" can have practical use in other areas of the Appalachian States and in other regions of the nation.

Pressing problems in the field of water resources, just as in other fields, often call for unprecedented procedures for their solution. New policies should be formulated and new

procedures tried. The traditional and often ponderous methods of securing authorization and funding of federal water and related land resources projects has not met the full range of the Region's water resource development needs in terms of the priority concerns established by States or other non-federal interests.

This major water resources survey was authorized simultaneously with the creation of the Appalachian Regional Commission. The responsibility for conducting the survey, rather than being given to the then fledgling but highly flexible ARC was given to the Corps of Engineers - - an agency which in part was hampered by the constraints of law, and established federal policies and procedures in this field. However, the Commission has been provided with the unique opportunity to receive the survey report from the Corps of Engineers; to prepare independent comments and recommendations; and then to transmit these comments and the report to the President for his review and transmittal to Congress.

The result has been that the Corps of Engineers has produced an excellent, but in most appearances traditional, plan for the continued development of the water and related land resources of the Appalachian Region. Therefore, the plan is limited in its ability to adequately fund a solution to many unique regional problems which can be efficiently and significantly affected by water resource investment, and which are deemed necessary to improve its economy in many areas. It is recognized that many of the limitations in this report are as much a product of the early limitations upon accomplishing effective comprehensive developmental planning - - by State and local, as well as Federal bodies - - as they are reflections of tradition and restraints in water resource planning.

Even though the present plan is limited in its application by many traditional policies and procedures, it is important to acknowledge where significant innovation has been introduced, particularly in terms of the project formulation and evaluation procedures concerning expansion and regional development benefits which tie the proposed projects closer to the developing economy of the Region.

However, it was only after the application of the revised formulation and evaluation procedures to a range of "pilot" projects, that it was apparent that it would be necessary to develop new policies to meet the Region's needs and assure the full effectiveness of the water resource investments.

There are many projects which either do not fit into the "standard" pattern, or under the policies, procedures, and criteria currently authorized by Congress are not eligible for construction by the Federal constructing agencies, i.e., by the U.S. Army Corps of Engineers, the U.S. Department of Agriculture's Soil Conservation Service, and even the Tennessee Valley Authority.

Acid mine drainage abatement projects, special purpose projects such as Naturealm and Otocsin in Pennsylvania, full consideration of pumped storage and thermal pollution control as project purposes, and many local flood protection projects, which are an integral part of several states' programs, provide prime examples of both the inadequate availability of funds or ineligibility under existing programs.

Some of these projects can and should be constructed by the States concerned, but their accomplishment depends, in large measure, on finding some method of obtaining additional Federal financial assistance in relation to the expected regional and national development benefits.

Furthermore, there are elements in good water resources development plans which can and should be planned and/or carried out by Federal agencies other than the regular constructing agencies, either separately or in close cooperation with the States under new or special programs.

Insofar as the Corps of Engineers and the Soil Conservation Service are concerned, acknowledging their different backgrounds in water resources investment, there is an urgent need to develop consistent and expanded criteria under which their investigation and construction program responsibilities can be carried out in closer cooperation with each other and with the responsibilities of other

agencies. Both agencies need to operate under unified methods and criteria for cost apportionment and funding procedures. Nearly all water resource investments now have multiple use purposes, whether planned or not. Participation by both agencies is normally limited by the fact that flood control benefits must be present. In addition, the extent and manner in which they may participate differs. Once again consideration should be given to further "standardization." In general, SCS programs meet localized upstream needs and stimulate local growth. The larger reservoirs proposed through the Corps of Engineers program are necessary to meet downstream urban needs and also to stimulate local and regional economic growth. Extensive State and local cooperation is required to implement both of these Federal agency programs. However, the combined programs do not fully cover the water resources needs and opportunities of the region. Therefore, changes in federal policy areas mentioned above are required to enable greater consideration of regional and local objectives, to fill the gaps, and to develop the full water resources capability of the region. New or amended federal legislation would be required to accomplish this.

Specifically, with regard to funding, the States would suggest that the Appalachian Regional Commission give full consideration in its report to recommendations for amending the Appalachian Act in order to provide authorization and funding for water resources projects through appropriations made directly to the Commission.

Two methods are set forth here, for consideration, in which such funds could be used to accelerate and construct projects now encompassed within this Plan or to be added at a later date as more definitive needs are shown and new program approaches are authorized by the Congress.

First, funds could be provided from the appropriation and assigned by the Commission to the federal constructing agencies for specific projects. These funds might supplement either, or both, the federal agency funds or the non-federal costs of the projects involved. Such funds particularly might be applied to some of

the "developmental" purposes which are sometimes considered ancillary to the water program purposes.

Secondly, funds could be provided from the appropriation by establishing a system of grants directly to the States so that the States could accelerate and construct projects which presently cannot move ahead under the policies, procedures, and criteria now guiding the federal constructing agencies or under the States' limited financial resources.

In the second method, the States would prepare proposals, submit applications for funding, and carry out the projects under appropriate contract conditions of the federal government which accompany the grant and in accordance with approved project plans. For example, a condition for federal financial assistance for a mine drainage pollution abatement project could be that the States have mine drainage abatement programs, as well as adequate mining regulation and water quality laws to prevent pollution from active mines and new mines.

In addition, more federal financial assistance should be provided to the States for planning and engineering studies, including the completion of specific project construction plans and specifications. A certain percentage of the total of planning funds should be made available to States before the initiation of any comprehensive water resources study so that the States can participate more actively.

The States are in accord with the findings in the report calling for study of changes in the Federal Water Project Recreation Act (P.L. 89-72). It appears that water resource investments can be reasonably made almost entirely for recreational purposes and that non-Federal project costs, both construction and operation, should be reduced in direct proportion to the extent to which regional recreation benefits also accrue to the national account.

It is believed that there is a limit to the assurances concerning water supply and recreation that the individual States can furnish to the federal government. In many of the

States, heavy commitments on federal projects preclude much further obligation without jeopardizing park and recreation programs maintained by the States themselves. This is particularly true where States must agree to assume operation and maintenance costs beyond their current financial capability.

While it may be argued that the recreation facilities provided at federal projects become an integral part of the States' park systems, and accordingly, should be administered by the States, the fact remains that if these facilities were to be constructed and operated by the federal government, the urgently needed and over-taxed facilities of the States' parks systems could be expanded and be better operated and maintained using the funds which otherwise would be absorbed at the federal projects.

The major objective of the Water Development Coordinating Committee's Study was to produce a plan that will promote regional development; however, it became apparent during the course of the study that existing federal procedures relative to plan and project formulation and implementation were being imposed on the Committee during the planning process, even though the process was beginning to identify opportunities to develop improved procedures that are essential to a full realization of the potential of the plan itself. These procedures tend to limit both the consideration of functions - - such as recreation - - and the development of projects which do not conform to existing federal criteria - - such as the requirements for flood control as a project function. However, such functions and projects are required to meet regional development needs.

The States recognize that there is a great need for better coordination and/or consolidation of the myriad federal water programs. Concerning mine drainage pollution abatement, for example, in the Susquehanna River Basin the Corps of Engineers has an authorized study, the Federal Water Pollution Control Administration has been financing and participating in studies and pilot projects, and the Appalachian Regional Commission's recently completed report on mine drainage pollution

recommended a systematic and expanded approach for abating acid pollution. In addition, the Commonwealth of Pennsylvania has active mine drainage pollution abatement programs which could be accelerated with federal financial assistance. The states of West Virginia and Maryland have also started planning to deal with this singular pollution problem.

Furthermore, changes are needed in federal policies pertaining to cost-sharing to enable greater federal financial participation in project construction for regional development, such as reservoir storage for municipal and industrial water supply, primary water conveyance systems, recreation and irrigation. Since regional development is the prime objective of the study, recommendations in this report should go beyond traditional federal approaches and should include the necessary means to implement those projects that would fully meet regional development goals and objectives.

The States recommend that the Appalachian Regional Commission create an advisory committee, composed of representatives of the States and the appropriate Federal agencies, to insure continuing planning for water resources development in Appalachia and to facilitate coordination with on-going state comprehensive water resources planning activities.

Such a committee would make possible the proper integration of water resources programs with other elements of the comprehensive Appalachian program which strive to stimulate economic development and to improve the well being of the people.

In summary, we believe that procedures for the development of water resources in Appalachia should have four significant aspects:

1. EVALUATION procedures should give consideration to expansion benefits in the economic justification of projects and plans. In the case of this Appalachian study, procedures for determination of expansion benefits were proposed and these benefits were considered in project justifications. This practice should continue.

2. **AUTHORIZATION.** Regional development requires a new method for authorization of projects, namely, one that responds to a regional development goal. The States suggest that consideration be given to authorization of projects through the Appalachian Regional Commission with agency participation and implementation. Consideration should be given to proposing inclusion in authorization procedures of provision for carrying out special responsibilities, such as those for water resource projects or project purposes involving comprehensive development objectives, by or through agencies such as the Commission or the States themselves.

3. **IMPLEMENTATION.** Federal procedures for project implementation should not be restricted by normal policies since regional development is the prime objective. Although economic evaluations were broadened for the study, federal implementation procedures apparently remained rigid. Consideration should be given to providing supplemental funds, through appropriate agencies, in order to accelerate construction of authorized water resource development projects where such projects need to be accelerated or broadened in purposes, to serve identified development priorities.

4. **CONTINUING ACTIVITY.** The States recognize that work remains to be done in proper definition and implementation of new policies and procedures. Thus the States are providing concurrence, to the degree possible, with the recommendations for policies and for specific projects which have been set forth in this report. The States urge accelerated action on such recommendations. To meet the opportunity to obtain greater benefits from water resource development potentials beyond those fulfilled in this report, however, the States propose to maintain continuing activity. As the present report is completed and in review, the States will work through the Commission and in cooperation with Federal agencies to provide mechanisms and procedures to make continuing work effective in terms of the experiences of the Appalachian program and the preparation of this report.

Finally, the Appalachian States want to congratulate Colonel John C. H. Lee, Jr. and his staff, and others associated in the endeavor, on the excellent job accomplished on this study, particularly when the complexities and the various constraints involved are considered. The States appreciate the opportunity to participate in an active role in this study which has been truly a state-federal cooperative effort in operation and which, we believe, can have landmark significance in its impact upon development of our region and the nation.

CHAPTER 10 - VIEWS OF THE FEDERAL AGENCIES*

1. INTRODUCTION

This Chapter presents the views of the Federal members of the Water Development Coordinating Committee for Appalachia, and of the supporting bureaus and offices. These agencies carried a great part of the load in preparing this report; they had prime cognizance of the nine Appendices, and provided essential inputs to the sub-regional plans (Part II) and, hence, to this Summary Report. Moreover, each of the projects detailed in Part III was coordinated, as appropriate, with the field offices having responsibilities for the principal federal programs involving:

- Fish and wildlife
- Water quality and water supply
- Soil conservation, agriculture and forestry
- Outdoor recreation
- Hydropower
- Archeological, historical and natural science values
- Geological and mineral values
- Water management and economic development.

The federal agencies participated actively in the nine meetings of the WDCCA, making important contributions to the most effective coordination that did take place. Without such active and generous participation, this report would lack much in validity and value.

2. DEPARTMENT OF AGRICULTURE

The Department of Agriculture, as a participant in the survey and a principal contributor to the Report, is in general agreement with the overall plan and recommendations. The plan, if approved and vigorously implemented, will make a major contribution to achieving objectives of the Appalachian Regional Development Act of 1965, as amended.

The survey represents a major undertaking and required close coordination and cooperation of the large number of Federal and state agencies involved. Particularly helpful and effective in this respect was the Office of Appalachian Studies, U.S. Army Corps of Engineers. The Department appreciates and has welcomed the opportunity to participate in the surveys.

The solution of many economic problems and needs of the Region is closely tied to development and use of all natural resources. All land and water in the Region are directly involved. The wise use, development, and management of all natural resources are basic to economic growth and welfare of the Appalachian Region.

Proposals recommended by the Department will help provide for more efficient and greater utilization of the Region's resources. The proposals will stimulate economic growth and enhance the well-being of the rural and smaller urban communities. This growth will complement and supplement the planned development of the larger growth areas, making possible greater overall benefits to the Region.

The following items should be emphasized:

a. The Department will be an active participant in any continuing organization for further planning and implementation of the recommended plan.

b. Special authorization will be required for the sixteen recommended upstream watersheds identified in the plan as having considerable non-rural expansion and developmental promise. The authorization to be requested would provide for the preparation of work plans in accordance with the principles and criteria of P.L. 83-566 and P.L. 89-4, with appropriate costs allocated to expansion and development as a primary project purpose,

* This chapter was prepared from inputs by the WDCCA members from the Federal Departments and Agencies and the supporting bureaus and offices. The views expressed do not necessarily represent those of the Corps of Engineers and the 13 Appalachian States.

comparable to the procedure used for proposed Corps of Engineers projects.

c. We wish to point out the priority Table 11-1, pages 1-11-2 and 3, can be misleading as it presents several types of projects, developments, and measures which are not comparable, and in many cases non-competitive. A variety of those proposals must and will be undertaken, either simultaneously or in a timed order, dictated by considerations other than an arbitrary assignment of priority.

d. A point raised in the Department's review of Chapter 6, Part III of the Main Report in November, 1968, has not been satisfactorily resolved. The point concerns objection to the method used in computing power benefits at the Hipes Reservoir and applying the comparability test as required by Senate Document 97. In the case of Hipes Reservoir, it was believed a more realistic "comparability test" would have been performed if the evaluation had been based on the alternative of a privately-financed steam plant rather than on an assumed Federally-financed steam plant.

3. DEPARTMENT OF COMMERCE

In the early days of the survey effort, the Office of Business Economics (OBE) was a most active participant. Based on procedures developed in previous studies in river basins and for the interagency groups that became the Water Resources Council, the Appalachian Region was examined for past economic performance and potential, as requested by the Office of Appalachian Studies (APS). The Economic Research Service of USDA made similar investigations.

These studies, including trade and commuting patterns throughout the area as well as with neighboring SMSA's, led to the definition of 27 economic sub-regions covering all of the 397 counties in Appalachia and nearly 200 other counties near by. Projections of population, per capita, and total income and employment (by major industrial groupings) were then made and reported. These projections, in turn, provided the basis for the "developmental benchmarks", which the Corps issued, tested and changed during the ensuing planning processes. All these projections and targets are published in Appendix E.

It is to be noted that OBE's projections were based, in part, on the Bureau of the Census "Series B" projections [1] of population growth. Series B projections were made up from a middle group of assumptions as to birth and death rates and other demographic factors. After performing its work for this Report, OBE has made similar, but nation-wide, studies for the Water Resources Council. In these later projections, based on recent indications that birth rates were declining below the Series B assumptions, lower range projections were adopted.

If, in fact, the future shows that the lower ranges of population growth rates should materialize, this will generally have the effect of "stretching-out" the projections. They will not be invalidated, but will be attained somewhat more slowly.

The Department of Commerce was also pleased to participate in the Survey in several other ways. The Business and Defense Services Administration made studies of manufacturing uses of water in Appalachia. Environmental Science Services Administration, through several cooperative programs, provided much basic data used in project studies. Economic Development Administration consulted, on frequent occasions, with the field offices preparing plans and project studies, on the economic development potentials in the Region.

The Department of Commerce considers the plan presented herein to be a valuable contribution to the future progress and growth of Appalachia. We hope to be able to assist in the recommended program of continuing studies.

4. FEDERAL POWER COMMISSION

The Federal Power Commission, in connection with the Water Development Coordinating Committee for Appalachia and its report on Development of Water Resources in Appalachia, has:

- a. Served as a member through its appointed representative;
- b. Furnished as Appendix B its report on Power Supply and Requirements;

c. Participated in reviews of sections of the report and of projects singled out for consideration; and

d. Cooperated with the other participating agencies and the Committee.

The Commission is concerned with the improvement and betterment of water resources to accomplish desired services, which are beneficial to mankind, as provided by sections of the Federal Power Act:

.... "To cooperate with the executive departments and other agencies of States or National Governments...."

.... "To make investigations of the water resources..., the water-power industry and its relation to other industries and to interstate or foreign commerce, and concerning the location, capacity, development costs, and relation to markets of power sites, and whether the power.... can be advantageously used..., and what is a fair value..., and

... "of assuring an abundant supply of electric energy ... with the greatest possible economy and with regard to the proper utilization and conservation of natural resources...."

The Commission staff has prepared Appendix B which, among other things, contains information on the developed and undeveloped sites for hydroelectric power throughout the 15 power supply areas in the eastern United States within which the Appalachian Region is located. Because of the terrain and water available, a majority of the sites of undeveloped projects is shown in Appalachia, and many more sites favorable to large pumped-storage installations are available. Most of these will, when developed, serve multi-purpose uses and furnish opportunities for recreation, water supply, flood control, and others besides power. These projects should be considered fully in any future studies and considerations of developmental programs.

It was possible, owing to many and varying factors, to include only a selected few of the potential projects for initial consideration in the Development of Water Resources report. Only one of these includes power as one of its purposes. There are several others in which power as a purpose may or may not be justifiable owing to various assumptions and factors of consideration at the time. Each project should, when it is studied further for authorization, be analyzed to determine whether or not power should be included as a purpose. For these studies specific and current power utilization possibilities for the potential developments, the value of such power, and the Commission's views should be requested.

5. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

The Department of Health, Education and Welfare is pleased to advise you that we support and endorse the Report. It is understood that our field level endorsement does not commit DHEW with respect to later official comments.

At such time as the plan or individual elements of the plan are implemented, our field offices will wish to participate in any technical coordination necessary, in order that the health aspects of water resource development projects will be fully considered.

We wish to take this opportunity to compliment the Office of Appalachian Studies and other participating Federal agencies and State agencies for their efforts in the planning and development of the Report.

6. DEPARTMENT OF THE INTERIOR

Bureau of Outdoor Recreation

The objectives of the Bureau of Outdoor Recreation are, broadly speaking, the coordination and development of recreation programs. These objectives generally have harmonized with many of the objectives of the Appalachian Regional Development Act. However, instances have arisen when economic development as an objective conflicts with recreation objectives and environmental considerations, especially with regard to such

issues as conservation, development, implementation and utilization of natural resources for outdoor recreation. This conflict has expressed itself in various ways during the Appalachian water resources studies.

At the time of the studies, comprehensive outdoor recreation plans for the 13 Appalachian States had not achieved a degree of detailed refinement which would have been useful in defining outdoor recreation needs. As a result, outdoor recreation alternatives were not clearly identified.

Many of the projects included as elements in the report are supported by large recreation benefits; consequently recreation carries a substantial allocation of both first and annual costs. These projects were initiated for inclusion primarily because of the flood control potentials. At each project, full consideration has been given to outdoor recreation, and benefits have been identified. However, it is the Bureau's concern that recreation carries a major proportion of the total benefits compared to flood control. Although recreation has been included, the Bureau cannot endorse recreation for all projects, as it is entirely conceivable that other sites and/or alternatives would be more desirable for outdoor recreation development. The test for economic efficiency is only one of several tests which are imperative for recreation to meet.

Where recreation shows significant benefits, the Bureau believes that agencies bearing responsibilities for promotion of recreation should be involved in determining, at the earliest stages of project formulation, the magnitude of outdoor recreation potentials "with" and "without" the potential project. Any endorsement of a potential project having substantial recreation benefits should be conditioned by identified needs and alternatives for meeting those needs as expressed in comprehensive outdoor recreation plans.

The proposed Logan Reservoir Project on Clear Creek, Ohio, is an example of problems which center around site selection and the depth of studies of alternative sites. The conflict here was the definition as to what are adequate studies of the outdoor recreation resource area, and finally the resolution of the concept of

conserving as it applies to the project area. It is apparent that the Bureau and interested agencies have not been able to make the indepth studies of alternative sites which they believe necessary to select the best site, but that such will be done is assured.

The proposed St. Petersburg Project on the Clarion River, Pennsylvania, illustrates the dilemma of judging a recognized natural, scenic water resource for its potentials after other potential uses are pre-empted by a potential impoundment. The Corps had requested the Bureau to evaluate the proposed reservoir and a preliminary evaluation of recreation days had been made, when PL 90-542 was passed, naming the Clarion for study as a potential wild, scenic or recreation river. Until the studies directed by the Wild and Scenic Rivers Act have been completed, concurrence by the Bureau in the proposed reservoir would be, at least, premature.

The proposed Royal Glen Reservoir Project is another example where water resource development has been investigated in depth. However, the application of project development on the recreation resources in the project area to the objectives of the Bureau cannot be fully understood until indepth studies are completed for the outdoor recreation resource area. The proposed management plan of the U. S. Forest Service for the Seneca Rocks-Spruce Knob National Recreation Area is subject to interdepartmental review before implementation. Thus, whereas the reservoir project area itself has been investigated in detail, the recreation resources such as the lands adjacent to the reservoir project have not received that degree of investigation which fully considers the outdoor recreation potentials. Until design details are completed, such as the exact location of Appalachian Corridor H, it is impossible to accurately measure the real effect of highway improvements, for example, on the recreation and scenic resources. Assurances by the action agencies as to the environmental and scenic values are only judgments made by representatives of these agencies to support their preliminary proposals. Clearly, when the Bureau is asked to review the proposed management plan, the scope of the proposals will require greater detail in order to evaluate these aspects with the objectivity required of the Bureau.

The problem relating to outdoor recreation and economic development appears throughout the whole course of the Appalachian studies. This problem is reflected by the Appalachian Regional Commission and the action agencies' use of the concept of outdoor recreation as an economic generator. The Bureau has the responsibility of coordinating and developing resources reflecting the interests of the American who seeks outdoor recreation. Economic objectives aimed at creating a favorable climate for business, commerce, tourist development, or whatever name is used, often meet the outdoor recreation objectives applicable to the development of outdoor recreation resources. On the other hand, concepts such as area redevelopment and recreation complex, terms which are extremely difficult to define, are broadly interpreted and merely confuse the public in its understanding of the function of outdoor recreation. Too often, the objectives of attracting people are promises of gold in El Dorado to interests seeking investment opportunities. As the statewide comprehensive outdoor recreation plans become more refined, these problems should show indications of diminishing.

U. S. Geological Survey

The major problem encountered in the study of ground-water resources is the absence of ground-water information for some areas. Much data were available for parts of the Region, but no data were available for other parts. Therefore, it is important to future basin studies that the current programs by State and Federal agencies investigating ground-water resources be continued and accelerated. The serious consideration of the relationship between surface water and ground water and the consideration of ground water as an alternate source for water supply and low flow augmentation is dependent upon a better knowledge of the occurrence and movement of ground water than is now generally available to water resources planners. The current State and Federal programs will help considerably to furnish the required knowledge.

Bureau of Mines

In areas taken for water development projects, the production of mineral resources

should be permitted when their removal will cause no permanent damage to the project. Properly planned and regulated mining operations can usually be carried on without permanent harm to the environment. The efficient use of mineral resources provides benefits to the Nation and the Region. In addition, the cost of the project is reduced by the amount of the damages that would otherwise be assessed for condemnation of the mineral resources.

National Park Service

Under the provisions of the Reservoir Salvage Act of 1960, P.L. 86-523, which specifically provides "for the preservation of historical, archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of flooding, building of access roads, erection of workmen's communities, the relocation of railroads and highways, and other alterations of the terrain caused by the construction of a dam by any agency of the United States," requires that "a survey shall be made of the area proposed to be flooded to ascertain whether such area contains historical and archeological data (including relics and specimens which should be preserved in the public interest)."

The National Park Service, under delegation of authority from the Secretary of the Interior by contract with recognized archeologists and institutions, arranged for archeological surveys for 21 selected reservoir sites in the 10 sub-regions of Appalachia. Seven of the selected sites did not require salvage. Sites requiring salvage are recognized in the sub-region reports, together with an estimate of costs. These surveys were confined to the water surface of the area to be inundated and did not take into consideration archeological, historical, and natural resources outside of the inundated area. Further, time and funds were not available for identification of irreplaceable visual and cultural resources and their needs for protection, preservation, and development.

The National Historic Preservation Act of 1966, P.L. 89-655, requires that any federally assisted undertaking in any state take into account its effect on any historic site or structure listed in the National Register of

Historic Places. The National Register of Historic Places is a list of properties significant to the Nation, to the states, and to local areas because of their significance in history, architecture, archeology, and culture. It was published in the Federal Register, Part II, February 25, 1969. Supplements announcing additions, deletions, and corrections are published in the Federal Register on the 1st Thursday of each month.

It is recommended that studies by the National Park Service for preservation and enhancement of areas of archeological, historical, scientific, and visual resources be requested and coordinated with the appropriate office having responsibility for construction of Appalachia projects. These studies should be requested when advanced engineering and design work on these projects is initiated.

Southeastern Power Administration

The substantial future need for electric power in Appalachia was reflected in the Power Supply and Requirements Report (Appendix B) issued by the Federal Power Commission. It stated "under either the normal or developmental benchmarks growth rate, future electric power requirements are enormous and impose a formidable demand for large increases in electric power supply." The Federal Power Commission points out that an additional 25,000,000 KW of peaking capacity will be required in the 15 power service areas serving Appalachia by 1980, and a total of 359,000,000 KW by the year 2020. The availability of economical electric power is crucial to growth of the Appalachian region. The region is endowed with natural resources containing all the elements for the production of significant amounts of hydroelectric power, as mentioned in the study.

The Federal Power Commission on page B-6 of Appendix B further stated: "Much of the mountainous area of the Eastern United States is within the Appalachian region. The source of many of the streams that empty waters into both the Atlantic Ocean and the Gulf of Mexico is in the Appalachian region. The mountainous terrain and available water provide a tremendous potential for pumped-storage and some remaining potential for conventional or combined conventional-pumped-storage hydroelectric

developments. Many of the potential hydroelectric sites, undoubtedly, will be developed as rapidly as their power can be used to satisfy a part of the total supply spectrum, provided they can be constructed and operated as economically as other comparable sources of supply."

There is considerable concern that the development of hydroelectric power potentials were not fully reflected in the final report. The St. Petersburg project on the Clarion River near Pittsburgh, Pennsylvania, with 420,000 KW of capacity, utilizing conventional and pumped-storage units, is the only project with power development proposed in the report for development prior to 1980.

Appendix B, Power Supply and Requirements, lists approximately 200 undeveloped hydroelectric sites in the Appalachian area. They represent over 29,000,000 KW of capacity, which is felt to be a very conservative figure, and upon complete evaluation for optimum development of the various sites the power potential might be higher by several orders of magnitude. The possibility that the total power potential at a site might be much higher than initially projected, is clearly demonstrated in the history of the Blue Ridge (formerly the Moore's Ferry) project. The reach of the river was originally planned to have flood control facilities. Later the plan for the reach of the river was revised to include small conventional hydroelectric power facilities. A potential installed capacity of 980,000 KW is reported in the tabulation of Appendix B. Upon complete analyses and a full utilization of the natural resources in the general reach of the river the installed capacity is now planned at 1,800,000 KW. This is many times what was originally thought that the reach of the river would support.

In addition to the Blue Ridge example, the possible development of the Swiss project on the Gauley River appears to offer substantial power potential. The capacity for the Swiss development with conventional hydroelectric units is shown as 20,000 KW in Appendix B. There are substantial estimates to believe that a development of the Swiss site can support a capacity of 2,000,000 KW and allow an

additional installation of around 500,000 KW at the Summersville project which is upstream from the site.

The Clinchfield Project on the Santee River near Chesnee, South Carolina, involves a site listed in the Federal Power Commission report for potential hydroelectric development. The project is being recommended for construction with flood control, water quality, water supply, recreation, and economic developments, but without hydroelectric power. Southeastern has previously stated its disagreement with the conclusion that power should not be included in the project. We believe there can be a feasible power development at the site without infringing upon the other legitimate functions of the project, either with the project basically as proposed, or in combination with other downstream developments. The report, as written, provides that hydropower be reinvestigated during advance engineering and design study. We believe that all possibilities for the inclusion of power in the project should be considered at that time.

The Appalachian Water Resources Plan did "assume that private power companies will provide the electrical energy as fast as it is needed to meet the developmental goals of the plan." It is believed that where a power installation is considered advisable, the question of public or private development is not felt to be the initial issue and concern. Irrespective of the ultimate developer of particular sites, the initial concern is whether the returns from the natural resources will be maximized, with the desire to derive the greatest benefits to the vital Appalachian region whenever a site is developed. It is important that full cognizance be taken of potential power developments for they, whether publicly or privately developed, can provide a measurable income to amortize the cost incurred. We conclude that the report does not sufficiently stress the prospects for power in Appalachia.

Bureau of Sport Fisheries and Wildlife

The Fish and Wildlife Service supports the proposed plan of Water Resources Development for Appalachia. In connection with developing the plan, the Service prepared estimates of needs for fish and wildlife to meet the expected

demand for fishing and hunting in Appalachia in the years 1980, 2000, and 2020. While the purpose of water resource development is not intended solely to produce fish and wildlife, it is gratifying to note that as a result of consideration for the habitat requirement of fish and wildlife the construction of the works of improvement recommended in the report will go a long way toward meeting the increasing needs predicted by the Service.

Despite concern regarding the construction of the Logan Reservoir project in Ohio, we believe that the findings in the report for further study regarding the controversial aspect of this project provides a mechanism for the eventual construction of this reservoir in a manner which will best serve the public interest.

Federal Water Pollution Control Administration

The FWPCA participated in the study as one of a group of Interior agencies whose activities were coordinated by the Department of Interior Ohio River-Appalachian Area Regional Coordinator. The Appalachian area falls within the area of responsibility of five FWPCA Regions. Each Region was responsible for the FWPCA input that related to its jurisdictional area. The Ohio Basin Region coordinated the FWPCA activity which also involved major portions of the Middle Atlantic and Southeast Regions and lesser portions of the Great Lakes and Northeast Regions. The FWPCA participated in the study by:

- a. Providing a detailed analysis of water supply and water quality control needs for 13 reservoir projects which were given detailed study.
- b. Providing a general area-wide appraisal of water supply and water quality needs for the 27 subregional areas, using estimates of population and employment necessary to meet "benchmark" levels or goals of development.
- c. Providing a major input for Appendix C, which defined the extent and severity of mine drainage pollution in Appalachia.

d. Providing a preliminary analysis of water supply and water quality control needs which might be met by upstream reservoirs studied by the Soil Conservation Service of the Department of Agriculture.

e. Participating in many meetings with State, local, and Federal agencies in developing programs and plans to meet water resource needs of Appalachia.

f. Reviewing report components of other agencies and providing comments and suggestions as appropriate.

Use of FWPCA Information

The information provided by FWPCA was transmitted to other cooperating agencies for their use in evaluating needs and potential projects to meet these needs in Appalachia. Water supply and waste loading projections using developmental benchmarks were formulated by FWPCA. Flow needs were developed for reservoir projects, which were subsequently converted to storage needs at various potential project sites by the Corps of Engineers and the Department of Agriculture. Allocation of costs and benefits to water supply and water quality control were formulated by the construction agencies utilizing information provided by FWPCA. In addition to the more typical elements relating to flow needs, FWPCA provided an appraisal of sources and quantities of mine drainage based on cooperative field studies with the State of Pennsylvania in the Clarion Basin of Pennsylvania. This information was used as a basis for determining the magnitude of mine drainage abatement necessary which is included as a part of the St. Petersburg Reservoir project in Pennsylvania.

FWPCA Views

a. The final report includes portions authored by FWPCA and other portions which were reviewed by FWPCA. Because of the limited time available for review of final drafts of some report components, less than an adequate review time was available for comments and evaluation of the plan as presented. Within the severe time constraints imposed in the final weeks of the study, as significant a review as possible was given to various report components. As a result

of this limited opportunity to adequately review all report components, it will be very important that projects which may be carried to advanced studies be evaluated further.

b. Data on water supply and water quality control needs as presented in much of Part II are based entirely, or in part, on information provided by FWPCA. In some instances estimates for portions of a subregion were developed by the Corps of Engineers. These Corps of Engineers estimates were developed, in many cases, by utilizing procedures described in Appendix D, authored by FWPCA. The hazard of applying this approach to small areas was presented in Appendix D and, therefore, FWPCA does not necessarily concur in all water supply and quality control estimates in the report. Attempts were made to properly describe the agency responsible for various water supply and water quality control estimates included in the report.

c. As noted in Chapter 11, Part I, of this report, the need for and/or amounts of water quality storage in Curry Creek and Stannard Reservoirs has not been completely resolved by local, State, and Federal agencies. These needs and the project formulations will require further evaluation during pre-construction studies.

d. The estimates of water supply and water quality control needs in some areas will be refined as more comprehensive and detailed studies better define estimates of needs. The results of these studies should be used in subsequent planning.

e. An emerging problem in many parts of the nation, including Appalachia, is enrichment of aquatic vegetation by nutrient pollutants. Although the occurrence of nuisance conditions is increasing rapidly, control mechanisms are not yet developed sufficiently to become a prominent feature of the water resource planning for Appalachia. Measures to combat nutrient enrichment have been included by TVA in proposed projects for the French Broad River Basin and FWPCA is carrying on laboratory and pilot plant studies on removal of nutrients at their source. It will remain, however, for future studies to cope with these problems as

nutrient levels become more critical and control measures become better established. Consideration should be given to the control of nutrients during preauthorization studies of individual projects.

f. The FWPCA is appreciative of the support and assistance of the Department of the Interior Ohio River-Appalachian Area Regional Coordinator, that of other Interior agencies, as well as that of other Federal, State, and local agencies.

7. TENNESSEE VALLEY AUTHORITY

Section 206 (c) of the Appalachian Regional Development Act of 1965 provides that the Secretary of the Army is to consult with the Tennessee Valley Authority in preparing this plan for Appalachian water resource development. Section 206 (e) authorizes TVA to provide assistance in this study. In accordance with these provisions, TVA has participated throughout the study as a coordinating committee member, and has drafted the parts of the report dealing with the Tennessee Valley portion of Appalachia.

The two TVA projects presented in this report, Yellow Creek Port and Upper French

Broad River, clearly fit the intent of the Appalachian Regional Development Act. They are formulated as key elements within the framework of area development plans having enhanced employment opportunities as a major goal. These two projects, however, do not constitute a complete water resource plan for the Tennessee Valley portion of Appalachia. They will need to be supplemented by other investments to meet identified needs in other parts of the area where continuing and future investigations are specified in this plan.

8. DEPARTMENT OF TRANSPORTATION

Consonant with the limited Department of Transportation capability in the water resources area, we have reviewed the various drafts constituting your study. When Departmental interests have been involved, comments have been submitted directly to the organizations originating each element of your study. As far as we have been able to ascertain, these comments have been reflected in your current draft. Consequently, subject to any further review in the Executive Branch, we have no objection to the findings and recommendations contained in your report.

Reference:

[1] *Projections of the Population of the United States by Age and Sex: 1964 to 1985 with Extensions to 2010*, Population Estimates Series P-25, No. 286, Bureau of the Census, Washington, D.C., July 1964.

CHAPTER 11 - FINDINGS AND CONCLUSIONS

1. PRIORITIES DERIVED WITHIN THE WATER PLAN

The plan for water resources development presented in Chapter 6, and developed in detail in Part II, incorporates a number of elements, including the on-going programs of federal and state water agencies; proposals for projects that should be considered for *early action* based upon their contribution to individual sub-regional objectives and needs; *early* and longer range study and development proposals; complementary regional development programs; and requirements for future development planning. To assure an orderly and rational implementation of this plan, a suggested ordering of priorities has been established that recognizes the potential contribution of the water plan to regional economic development (the principal objective established for plan formulation), and the capability and willingness of local interests and others to provide the programs that complement the water resource development plan (the consensus on needs described in Chapter 5).

With respect to the projects and studies that represent the *early action* elements of the plan, high priority was assigned to the water resource investments that make significant contributions to regional growth, that more immediately satisfy urgent needs within a basin or a sub-region, and where programs to complement the water projects are already underway or close to implementation. More precise determination of actual priorities, other than as suggested below in Table 11-1, must of necessity be developed at the highest policy levels and frequently be reviewed in the context of priorities established by the States, the Appalachian Regional Commission, and among all the inter-related program elements. Table 11-1 does not attempt to list every plan element designated for "early action" in Chapter 6; the table is only an indication of the relative urgency of various critical elements in the plan, as they were viewed by those responsible for report preparation, at the time of writing.

2. FINDINGS, AS TO MAJOR PROJECTS IN THE PLAN

Table 11-1 shows a wide variation among the priorities within the States of the Appalachian Region. These variations stem from the diversity of topography, and forms of economic development, in the several parts of the Region. A similar diversity can be found in the relative emphases included in the mixture of goods and services provided by the projects which are included in the plan.

Projects Providing Flood Control as a Major Service

All of the projects, save the two pertaining to navigation and the two submitted by Pennsylvania, provide additional control of floods. In some cases, as in Hipes, Clinchfield, Curry Creek, Dalton, Stannard and Whiteoak Reservoirs, the benefits from the additional flood control are fairly widespread, both within and downstream from the Region, and the flood control aspects are not considered of major importance to regional expansion. On the other hand, the rest will clearly improve the economic environment by freeing urgently needed developable lands from flood hazards.

In the Royalton Reservoir - Salyersville Area project the land use development plan shows it is probable that, when fully developed, nearly 10,000 new jobs can be attributed primarily to the flood control provided; of course, in conjunction with the existing Appalachian Corridor through Salyersville, other water services provided by the project, a "package" of developmental expenditures for public utilities to support growth, all attracting nearly \$200 million in private investments. Similarly, the Midland Local Protection project, also on the Licking River, will permit the development of a new city.

The Tamaqua Local Protection project provides its expansion effects by permitting a

TABLE 11-1
PRIORITIES FOR SOME EARLY ACTION ELEMENTS WITHIN THE APPALACHIAN WATER DEVELOPMENT PLAN *

STATE	Priority in descending order			
	I	II	III	IV
Alabama	<p>(1) Development of navigation works on the Tennessee-Tombigbee ^{**} rivers to provide a direct transportation outlet from the Tennessee River to the Gulf of Mexico.</p> <p>(2) Extension of navigation works on the Coosa River to make it navigable to Rome, Georgia.</p> <p>(3) Completion of flood control and water quality studies of the Black Warrior River Basin.</p>	<p>(1) Upstream watershed project, Luxapallia Creek, designated for early action.</p> <p>(2) Water supply for the Birmingham complex.</p> <p>(3) Development of recreation facilities on Lake Lewis Smith in the Bankhead National Forest.</p>	Study within the Alabama-Coosa River Basin of emerging water related problems.	Investigation of flood control problems and water supply along small tributary systems.
Georgia	<p>(1) Water supply and water quality management in the Dalton-Calhoun growth area.</p> <p>(2) Upstream watershed projects designated for early action.</p>	<p>(1) Development of Curry Creek for flood control, water supply and recreation to meet the economic development of Athens and the surrounding six county area.</p> <p>(2) Extension of navigation on the Coosa River to Rome, Georgia.</p>	<p>(1) Comprehensive studies for all purposes by TVA in the Georgia portion of the Chattahoochee SMSA.</p> <p>(2) Development of recreation opportunities on existing reservoirs in the Chattahoochee National Forest.</p>	Flood plain information studies at: Dahlonega, Gainesville, Dalton-Calhoun, Elipoy, Canton, Rome, Cedartown, Rockmont, Summerville, Carrollton, Athens, Winder, Commerce, and Jefferson.
Kentucky	<p>(1) Local flood protection for the proposed new town of Midland below Cave Run Reservoir.</p> <p>(2) Upstream watershed projects designated for early action.</p> <p>(3) Flood control on the Upper Licking River and urban development of the flood plain.</p>	<p>(1) Flood plain studies for Hazard and Harlan areas, involving urban redesign.</p> <p>(2) Expedite funding to Forest Service for recreation facilities at Corps reservoirs in Daniel Boone National Forest.</p>	Improvement of the Kentucky River for recreation, and the possible development of a National Recreation Area encompassing the Red River and the Palisades areas.	Complete studies of Big Sandy, Kentucky and Upper Cumberland Rivers for future developmental needs.
Maryland	<p>(1) Water quality improvement and flow augmentations on the Potomac River.</p> <p>(2) Upstream watershed project, Upper Casselman River, designated for early action (also in Pa.).</p>	Comprehensive investigation of Youghiogheny and Upper Casselman (also in Pa.).	Upstream watershed developments - Potomac River.	Flood plain information studies for Hagerstown.
Mississippi	<p>(1) Construction of authorized Tennessee-Tombigbee River System, ^{**}.</p> <p>(2) Development of Yellow Creek Port.</p>	Comprehensive study of flood control and other water related needs in Tombigbee River Basin.	Expedite authorized channel clearing projects on Tombigbee River and tributaries for water quality improvement purposes.	Continue planning and installation of rural and regional water distribution systems.
New York	<p>(1) Flood protection and water quality improvement in Chemung and Susquehanna basins above and below Binghamton.</p> <p>(2) Upstream watershed projects designated for early action.</p>	<p>(1) Flood protection and water supply in the Upper Delaware.</p> <p>(2) Development of storage for supplemental irrigation and industrial water supply in Genesee River valley.</p>	<p>(1) Development of upstream watershed projects to give local flood protection, water supply and recreation.</p> <p>(2) Flood protection along Cattaraugus Creek.</p>	<p>(1) Development of small boat harbors and recreation areas on Lake Erie.</p> <p>(2) Development of local protection projects in connection with lake front flooding.</p>
North Carolina	<p>(1) Implement the Upper French Broad River improvement plan, ^{**}.</p> <p>(2) Develop Clinchfield Reservoir for water supply and recreation.</p>	<p>(1) Study of emerging water problems in the middle portion of the Yadkin River.</p> <p>(2) Development of recreation facilities in Pisgah National Forest.</p>	<p>(1) Additional reservoir storage capacity on Yadkin River taking into account the effect of the Reddies Reservoir.</p> <p>(2) Study of flood control for major storms at Morganton.</p>	Continuation of TVA studies for Pigeon and Little Tennessee Rivers.

TABLE 11-1 (Cont'd)

STATE	Priority in descending order			
	I	II	III	IV
Ohio	(1) Ohio River mainstem flood plain information, and Southern and Southeastern Ohio Tributaries studies. (2) Study of a possible National Recreation Area in the Hocking Hills. (3) Support to "Project Scioto" by flood control at Lucasville.	(1) Complete studies of Logan damsite and construct reservoir. (2) Whiteoak Reservoir and the industrial development of Brown County. (3) Upstream watershed projects designated for early action.	(1) Completion of Muskingum basin study. (2) Expedite construction of recreation facilities in Wayne National Forest.	Continued development of facilities for water based recreation and for fish and wildlife.
Pennsylvania	(1) Abatement from mine drainage pollution, especially in the Anthracite Region. (2) Upstream watershed projects designated for early action. (3) Development of local protection from floods for Tamaqua, Pa.	(1) Development of multiple purpose project on the Clarion River in the vicinity of St. Petersburg (including reclamation for mine drainage abatement). (2) Increased flood protection in the Susquehanna and Upper Ohio basins, flood plain studies as appropriate. (3) Installation of the Pennsylvania recreation plan serving the National Interstate System at strategic points, as at the Otisum Project.	(1) Accelerate studies of the Beaver River Basin in Pennsylvania and Ohio, of Backoon Creek, and of Big Sandy Creek, in Pennsylvania and West Virginia. (2) Develop nature preserves (Naturetrail along the shore of Glendale Lake in Prince Gallitzin State Park). (3) Expedite construction of recreation facilities on existing reservoirs in, and throughout Allegheny National Forest.	(1) Complete studies of Vacationlake. (2) Studies to develop greater potential from existing reservoirs in Western Pennsylvania. (3) Navigation facilities in Erie harbor (West Bay), and further study of rehabilitation of Presque Isle.
South Carolina	(1) Develop Clinchfield Reservoir for water supply. (2) Study water conveyance systems to distribute water from major projects, possibly involving interstate transfers.	(1) Improve water quality along Broad and Saluda Rivers, and in the Savannah Basin. (2) Upstream watershed projects designated for early action.	(1) Development of local flood protection works for both urban and renewal areas (Pacolet). (2) Complete study of Chattooga River, for wild and scenic river classification and develop recreation opportunities in Sumter National Forest as recommended in approved plan.	Complete proposed flood plain information studies.
Tennessee	Improvement of local flood protection for secondary growth centers, by levees, channel improvements, and small watershed projects.	(1) Development of community water supply systems, some to serve rural areas. (2) Upstream watershed project, Salt Lick Creek, designated for early action.	Encouragement for development of recreation facilities for state forest areas, and development of recreation facilities on existing TVA reservoirs in the Cherokee National Forest.	Pollution control in critical mainstem reaches and in certain tributaries.
Virginia	(1) Flood control for upper James River. (2) Flood protection and water quality for Bluefield. (3) Water quality in Holston River at and downstream from Saltville.	(1) Development of the Blue Ridge projects (Appal. Power Co.). (2) Local flood protection for Big Stone Gap and Duffield.	Flood control, water supply and recreation for Holston River and on Upper Clinch River, for town of Tazewell.	Development of recreational complexes in George Washington and Jefferson National Forests.
West Virginia	(1) Water quality improvement, especially pollution abatement from mine drainage. (2) Improved flood control where it will encourage early economic development, and relief of chronic suffering in areas of persistent flood hazard. (3) Development of facilities for water based recreation and for fish and wildlife.	(1) Upstream watershed projects designated for early action. (2) Complete proposed flood plain information studies. (3) Accelerate development of recreation facilities in the Monongahela National Forest, especially in the Seneca Rocks-Spruce Knob National Recreation Area.	Completion of river basin planning (Kanawha and Monongahela Rivers) (former also in Va. and N.C., latter also in Pa.).	Local flood protection through development of river channel improvements and accelerated planning of upstream watersheds.

* These priorities assume: (1) a continuing, federally assisted, program of installation of secondary treatment facilities for municipal and for industrial sewage on those streams where such is necessary to achieve state water quality standards; (2) acceleration of planning of the going programs of upstream watershed project installation; and (3) application of the USDA recommended acceleration of going programs, land treatment, and the recreation and other developments in the National Forests, essentially to follow the priorities set forth in Appendix A, and as summarized in this Chapter.

** Denotes projects for which at least initial design monies are budgeted.

significant urban renewal in a city with seriously constrained topography. The Royal Glen Reservoir, in eastern West Virginia, will remove flood hazards from 500 acres of land just south of Petersburg, where there is not only access to an Appalachian Corridor, but also an existing rail connection.

On the Yadkin River in North Carolina, and after the Reddies River Reservoir is operational, the Roaring River Reservoir will provide badly needed flood control in the communities of Elkin-Jonesville, permitting some expansion. Similarly, TVA's Upper French Broad Project will have major impact on the developable flood plains near Hendersonville and Asheville.

The effects of St. Petersburg Reservoir and of Logan Reservoir are less specific as to developable land, but still important to the Region's economy. The former will provide additional flood control on the Lower Allegheny and the mainstem of the Ohio, but the effects can only be judged as part of the present and future systems of flood control that will gradually permit increasing flood plain development. Similarly, the value of Logan Reservoir to the Hocking River communities of Logan, Nelsonville and Athens is that, operating as a system with their channel improvements, an acceptable degree of protection is provided.

The Lower Knox Creek Reservoir, if constructed, operating in a system with the authorized Panther Creek Lake, would control about 16 percent of the drainage area above Williamson, West Virginia, the major damage center. Although these two structures will clearly reduce the frequency of overtopping the local protection works in the Williamson area, they will not provide enough control of otherwise unprotected areas significantly to change the flooding characteristics of Tug Fork.

Projects Providing Expansion through Water Supply

Eight of the projects in the plan have been scoped to provide water supply storage to meet both present needs and anticipated future growth potentials. Even though the amounts of storage in Royalton, Stannard, and Roaring River

Reservoirs are not large, they are essential elements in the package of goods and services provided to stimulate growth.

The water supply in Dalton Reservoir is urgently needed to prevent a serious constraint in the present growth rates in the Dalton-Calhoun growth center in northern Georgia. Similarly, the water supply in Clinchfield and Curry Creek Reservoirs will support a continuation of the rapid rates of growth already occurring in the areas to be served. Finally, the water supply in the Whiteoak and Logan Reservoirs is anticipated to encourage new growth in areas where the present limited sources of municipal and industrial water can be considered one of the major deterrents to growth.

Projects Providing Major Recreation and Fish and Wildlife Services

For reasons given in Chapters 4 and 5, above, water-oriented recreation has been stressed in this plan. Therefore, each proposed project has a potential for contributing to the Region's ability to provide increased opportunities to its citizens, and to visitors from outside. Excluding the navigation projects, the other projects in Part III will have an eventual capability of providing outdoor recreation to 23,600,000 visitors per year.

The unusual features in the plan include the following: (1) the Otocsin and Naturealm projects by the Commonwealth of Pennsylvania are heavily oriented toward recreation; (2) the Royal Glen project will act to form a gateway to an authorized National Recreation Area; (3) the Dalton, Curry Creek, Stannard and Hipes projects provide for downstream land acquisition for fishing access; and the latter also includes a trout rearing station; and (4) the Whiteoak project includes acquisition of 5500 acres for a migratory waterfowl refuge.

Projects Providing Navigation Services

Sufficient evaluation of the authorized Tennessee-Tombigbee Waterway was performed, during the preparation of the plan for Sub-region E (Chapters 9 & 10 of Part II), to show that this project can produce major expansion effects in Appalachian Mississippi as well as in nearby

counties in neighboring states. Its accelerated construction is an urgent necessity to attain the goals of the Appalachian program. The Yellow Creek Port, on the existing Tennessee Waterway, can efficiently be constructed at this time since its success is not dependent upon completion of the Tennessee-Tombigbee Waterway - although it will also serve as a terminal port for the latter. The authorized Coosa Navigation Project has also been studied in detail, and this report has found favorably on construction of locks through the existing dams of the Alabama Power Company, again anticipating considerable expansion in industrial activity.

Findings as to the Economic Performance of the Major Projects

As was discussed in Chapter 7, and shown in Table 7-1, two indices of performance have been developed to represent measures of the economic performance of the major projects proposed in the plan against the two principal

objectives - - regional economic expansion and national income gains. Neither index fully measures project effects: the national efficiency index does not credit expansion effects falling into the national account; and the index measuring regional income gains applies only to wages and salaries and fails to count other income flows such as returns on investments, rents, taxes, and so forth. The regional expansion index measures the total wages and salaries accruing to all people who are employed as a result of the project and induced investments. As such, this index includes gains to previously employed as well as those who would otherwise be unemployed in the absence of the project. However this index must be secured only a partial measure of the total required impact of a project. For this reason there is no absolute minimum threshold for this index since it has significance only in relative to the same index for other projects. The major projects can be ordered, against these indices, as follows:

<u>National Income Gains</u>		<u>Regional Expansion</u>	
<u>Index</u>	<u>Project</u>	<u>Index</u>	<u>Project</u>
1.9	Otocsin	10.2	Yellow Cr. Port
1.7	Clinchfield	9.4	Midland LPP
1.5	Hipes	6.7	Clinchfield
1.3	U. Fr. Broad System	5.0	Whiteoak
1.2	Curry Creek	4.8	Royalton-Salyersville
1.2	Stannard	3.3	Roaring River
1.2	Naturealm	3.1	Curry Creek
1.2	Tamaqua LPP	2.6	U. Fr. Broad System
1.1	Dalton	2.5	Dalton
1.1	St. Petersburg	2.3	Coosa Navigation
1.1	Coosa Navigation	2.2	St. Petersburg
1.03	Logan	2.2	Naturealm
1.03	Roaring River	1.8	Otocsin
0.96	Royal Glen	1.8	Tamaqua LPP
0.95	Whiteoak	1.6	Royal Glen
0.8	Yellow Cr. Port	1.4	Stannard
0.6	Lower Knox	1.2	Logan
0.44	Royalton-Salyersville	0.8	Hipes
0.4	Midland LPP	0.3	Lower Knox

Findings as to Other Project Goods and Services

A number of the reservoirs in the plan contain storage allocated to water quality. Here, under the assumption given in Chapter 5, water quality storage is necessary in order that growth may continue without degradation to Appalachia's streams. In the case of Curry Creek Reservoir, full agreement as to need for water quality storage has not been reached with the Department of Interior; hence such storage has not been included as a project purpose, but during post-authorization planning a restudy of this need should be made. In the case of Stannard Reservoir, the question is the quantity of storage needed, and again this determination can be made during post-authorization planning.

In the case of St. Petersburg Reservoir, special measures of acid mine drainage abatement and mined lands reclamation have been incorporated in the project plan so that the waters of the Clarion River reservoir, when impounded, may have adequate quality to attain other project purposes. These measures should be initiated as soon as possible following authorization to restore the water quality and the environmental quality of surrounding lands. Provisions for hydropower in St. Petersburg Reservoir will augment the developmental potential and may be constructed either as a Federal or a non-Federal investment, as determined by the Federal Power Commission.

Irrigation storage in Standard Reservoir will meet identified local needs.

In consideration of ecological and scenic values, the Logan Reservoir Project includes acquisition of an area below the dam to preserve and develop these values, and in view of this the actual location of the dam will be determined during pre-construction planning.

3. FINDINGS, AS TO OTHER ELEMENTS IN THE PLAN

There is a host of elements in the plan herein presented, other than the projects on which appropriate findings are detailed above. It is impractical to report on all of these other elements; only highlights are discussed herein.

State Conducted Programs and Views

As may be seen by examination of the State Supplements in Part V of this report, there is a wide variation in the programs of water resource development among the Appalachian States. However, each has made an analysis of its most urgent needs and is -- within available resources -- conducting programs appropriate to meet these needs. All of the States face quite difficult problems in attaining and enforcing water quality standards, even with the levels of federal fiscal assistance authorized in recent Acts, but for which funds were not subsequently appropriated.

Assisted by the Land and Water Conservation Fund Act (PL 88-578), each of the States has active programs to provide increasing recreation opportunities to the general public; for reasons given in Chapters 4 and 5, these programs should clearly be accelerated, especially in and near the major centers of population. However, as stated in Chapter 9 by the States and, to a degree, by the Bureau of Outdoor Recreation in Chapter 10, the application of the Federal Water Project Recreation Act (PL 89-72) operates to cause dislocations within priorities and resource allocations assigned by state-wide outdoor recreation plans. In order to meet the required cost sharing, limited state funds must be diverted from programmed recreation activities and tend to delay the implementation of otherwise worthwhile projects. The overall approach represented by the Otocsin Project -- where the Commonwealth of Pennsylvania is offering, to the private sector, partnership in development of a most promising recreation complex -- is to be encouraged.

The Appalachian States propose, in Chapter 9, reductions in the amounts of cost-sharing required by applicable statutes and policies; a broadening of the traditional Federal interests in project purposes; and an acceleration of the sometimes lengthy process of authorization and appropriations. In regard to a reduction in non-Federal costs, if relief from heavy initial investments in public water projects encourages non-Federal interests to concentrate expenditures on associated investments needed to accomplish the development objectives of the plan, the growth

stimulated by the development plan could produce taxes for the later reimbursement of local cost-sharing requirements. Accordingly, consideration should be given to procedural changes which include (a) that the Federal Government may finance all of the initial costs for local flood control projects and that the repayment of non-Federal costs, with interest, follow after a ten-year interest-free period [1]; and (b) that prior to the construction of these elements of the plan, the Secretary of the Army be assured that complementary non-water resource public investments -- which must be undertaken for the recommended plan to attain its objectives -- will in fact be initiated by non-Federal interests. In respect to the broadening of permissible Federal interests in project purposes, the National Water Commission is considering studies which would explore the implications of such an action.

Although no studies have been conducted during this Survey in the required detail to prove the point, preliminary investigations clearly show the desirability of aggressive state leadership in solving municipal water supply problems involving conveyance systems to several communities; here the problem appears to lie in scoping for adequate capacity to assure future growth and development.

Department of Agriculture Elements

The U.S. Department of Agriculture has many authorized programs which can assist in the development of the Appalachian Region. Three elements in the plan are especially noteworthy. The program of preliminary upstream watershed investigations which was conducted during the Survey clearly shows that upstream watershed projects can be scoped not only to accomplish the original goals of that program (PL 83-566), but also to provide goods and services which will enhance the Region's potential for non-agricultural industrial growth. Forty-two upstream watersheds have been specifically selected for early action; some 190 additional watersheds also show considerable developmental promise.

The assurances, as required by PL 83-566, that local interests will furnish lands, easements and rights-of-way, are difficult to obtain through local Soil and Water Conservation Districts, and other sponsors, even in agricultural areas enjoying reasonable prosperity; in Appalachia, obtaining these assurances has directly inhibited application of the program. Funding for the accelerated planning of the 190 promising upstream watershed projects should be considered.

Appendix A, Agriculture, Forestry and Conservation, also contains recommendations for a program of accelerated land treatment and improved management in the Appalachian Region, and would provide continued and increased production of food and fiber, and reduction of floodwater, erosion, and sediment damage. It would also increase outdoor recreational opportunities and employment, and improve the resource base, the economy, and the environment. Priority would be given to critically eroding areas and the drainage areas above existing and recommended water resource developments to improve their efficiency and prolong their useful life, followed by acceleration of land treatment measures on watersheds above recommended water developments contained in this plan. These programs will be periodically reviewed with the Appalachian Regional Commission by the Department of Agriculture, and continuing coordination of programs under PL 89-4's Section 203, Land Stabilization, Conservation, and Erosion Control, Section 204, Timber Development Organization, and Section 205, Mining Area Restoration, maintained.

Supplement B to Appendix F, Recreation and Aesthetics, presents a program of accelerated recreation development in the 15 National Forests in Appalachia. Almost all of these Forests will soon enjoy greatly improved access through the twin programs of the Interstate Highways and the Appalachian Corridors. The programs recommended will clearly enhance the attractiveness of the Region to the tourist, and sharply increase the quantity and quality of the outdoor recreation opportunities of Appalachia. The developments and related measures are

[1] A procedure followed in the Water Supply Act of 1958. Deferred reimbursement is permitted by legislation relating to recreation (PL 89-72).

authorized by going programs of the Forest Service, but substantial acceleration of funding is required to meet present and projected needs. In two cases, the expenditures would support authorized National Recreation Areas. Land holdings within the National Forests are such that the proposals for expenditures on public lands will actually encourage complementary investments on private lands to provide lodging and other tourist services. These proposals by the Forest Service should be carefully examined by the Appalachian States, and the Commission, and appropriately supported.

Department of Interior Programs

The programs of the Department of Interior agencies which have contributed to the preparation of the plan herein submitted, and which should be continued during plan implementation, are most numerous. Again, only highlights are mentioned below.

The programs of the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife are vital to enhancing the recreation potential of Appalachia. When improvements are made in the widespread conditions of acid mine drainage pollution, many streams in Appalachia will again be able to support an active sports fishery. Even now, the full fishery potential of Appalachia is far from being realized, and the cooperative programs of fishery development with the Appalachian States are to be encouraged. The commercial fishery potential of the Region -- a potential which can apparently be realized without impairment of sports fishing -- should continue to receive active support by the Bureau of Commercial Fisheries.

The continued cooperation of the National Park Service in regard to the identification of the archeological, historical and natural science values near reservoirs is an essential service so projects may be planned to achieve the full potential of environmental values.

The programs of the Federal Water Pollution Control Administration and of the U.S. Geological Survey concerning ground and surface water availability and quality are critical to the continued development of the Appalachian Region. The relatively ample natural water

resources may not be available in the required quality and quantity without these programs. Especially critical is FWPCA's grant-in-aid program to the states and municipalities for the construction of secondary treatment plants in most parts of the Region.

4. FINDINGS, AS TO THE APPALACHIAN SURVEY REPORT

Overall, this four-year study of water resource development in Appalachia has given the participants a unique opportunity to evaluate the potential impact of water resource investments on the economic environment in an underdeveloped region. Because management of Appalachia's water resources had already been determined to be nationally important, both of itself and to many areas of major economic potential outside the Region, a large water development program is already underway. Nevertheless, the survey has uncovered many areas where the conventional national water development program would not have found favorably on additional investments, simply because the present degree of economic development could not currently show enough benefits of the water program's goods and services. In other words, so long as national efficiency criteria, only, were used to evaluate public investments, it would be impossible to formulate needed and additional water resource projects responsive to other objectives such as regional development.

It was in the context of a need for a "new look" at water resources investments and their relationships to regional growth that the Congress incorporated Section 206 into PL 89-4. This report presents both the successes, and the shortcomings, of the directed effort.

First, as to shortcomings, it is re-emphasized that this report fails adequately to deal with certain important aspects of water management and planning. Much new information is needed in order to determine the water-oriented recreation capacity of the Region, and then to determine whether to limit demand (use) to preserve recreation values from over-crowding. Also, as discussed in Chapters 9 and 10, present policies concerning recreation at Federal reservoirs cause difficult accommodations

in state-wide outdoor recreation plans. Studies are needed of changes in the Federal Water Project Recreation Act (PL 89-72) with respect to scaling of projects and cost sharing to permit Federal construction of projects which have substantial public benefits, meet long-range development needs for water-oriented recreation, and contribute to the economic development of the Region and the Nation.

As discussed in Chapters 4 and 5, this report has not fully considered the potential impact on Appalachia's water resources base of the vastly increased electric power generation demands that can be anticipated. Studies are needed for changes in law, policy and procedures to facilitate the incorporation of thermal and hydroelectric power development plans, including detached pumped storage installations, into long-range plans for river basins development, giving full consideration to the alternatives of necessary future investor-owned electric power generation balanced against other desired uses of the water resources base.

As discussed in Chapter 5, during the preparation of this report several cases were uncovered where added storage in upstream watershed projects was physically feasible and would produce benefits in water quality. Studies are needed to determine whether the inclusion of water quality storage in upstream watershed projects would be compatible with the objectives of the Watershed Protection and Flood Prevention Act (PL 83-566, as amended), and be consistent with the roles of local interests defined therein and, if so, whether changes in the law should be recommended in order to provide for such storage, either as a fully or partly non-reimbursable Federal purpose.

As discussed in Chapter 5, several other constraints operated to limit the scope of the plan. For instance, the Anthracite Region of Pennsylvania presents an extremely complicated environmental problem, compounded by many interrelated factors such as acid mine drainage, municipal and industrial pollution, mine subsidence, restoration of mine disturbed land, surface and sub-surface flooding, and watershed rehabilitation. There are on-going corrective activities in various stages of planning and implementation which involve various State and

Federal agencies. A program to expand and accelerate these on-going activities has been designated as the emergency priority element of the plan for Appalachia Pennsylvania. The recommended study, which is a part of this program, must address the problem of responsibilities for management of concerted efforts at environmental improvement where numerous public works programs, already assigned by statute to several agencies, must be coordinated during implementation. Therefore, as in the present study of water supply in the North-East (see Chapter 5), the study's recommendations in regard to institutional arrangements and policy will be awaited with much interest.

Chapter 9, prepared by the Appalachian States, proposes studies and changes in policies and procedures of far-reaching import to the national programs of water resources development. These proposals appear to be soundly based, but will require additional analysis and study -- using specific case studies as appropriate -- before the issues raised can be resolved.

Second, it must also be acknowledged that not all pressing water resource investigations were completed. There are numerous present, or immediately impending, needs in Appalachia that have not been analyzed in requisite detail simply because the resources available did not permit their study. These needs are mentioned in Chapter 6, and in Part II, and require a program of continuing and future studies.

Lastly, some other deficiencies in this report that remain unresolved are discussed in Part IV, Concepts and Methods, which details a number of open-ended issues on which doctrinal and methodological resolution is desirable, and on which only an interim solution was adopted for reporting purposes. The major issue, which is also reflected in the performance indices, is the credibility to be attached to the estimates of expansion effects which may be placed in the national account. These issues are already under study by the Water Resources Council, by the U.S. Army Engineers Institute for Water Resources, and by other national and interstate agencies.

As to the positive aspects of the report, one can point, first, to the Sub-regional Plans in Part II, summarized by states in Chapter 6 of this Part. These represent the results of major planning efforts, where all identified needs were brought into balance against physical and economic capabilities, all in the interest of supporting and stimulating growth potentials. When the pending interagency basin surveys on the Susquehanna and Kanawha, and the restudy of the Muskingum, are complete, a matrix of recent plans will be available to the Commission and the States so that judgments as to priorities can have augmented validity.

Secondly, perhaps the most favorable efforts conducted are reflected in the Project Analyses, found in Part III of this report. Each project proved to have individual and unique characteristics; each could contribute to regional, and national, economic strength in differing ways and emphasis; and, thus, each required variations in the methodologies presented in Part IV.

Finally, the report addresses the basic question proposed by Section 206 of the Appalachian Regional Development Act of 1965. The history of the legislation shows that the Congress held that the nature of the water problems and the deteriorating condition of the Region's economy made it necessary to view water resources services as a means of increasing the economic opportunities and thus enhancing the welfare of its people. It is believed that this report substantiates desired and justifiable changes in methods of analysis to allow underdeveloped areas to compete with their more affluent neighbors, but only when encouragement of their valid potentials for change and development is clearly in the public interest.

5. FINDINGS, AS TO PLAN IMPLEMENTATION

In reporting out the Appalachian Amendments of 1969, the Senate Public Works Committee termed the program authorized by PL 89-4 already a success. [2] Rapid passage of the bill by unanimous vote shows that the Senate confirms that judgment.

Several reasons are given for the progress and improvements that were noted in the Appalachian economic and social environments. One is, certainly, the existence and performance of the Appalachian Regional Commission (ARC), which has facilitated communications among all public and most private interests in Appalachia, and catalyzed favorable investment decisions in the Region that probably would not otherwise have occurred. There are now development plans in all the thirteen states and, even though a number of federal programs affecting the economy are not "Appalachian" -- in the sense of being controlled by ARC -- they nonetheless are conforming to the ARC-induced plans of the states and local development districts. As was acknowledged above, ARC was most helpful in the development of the plans herein submitted.

Yet the program carried out in the last four years is far from complete. This leads to the observation that, although the Commission's life under the present law terminates on June 30, 1971, a continuing coordinating and directing mechanism beyond that date is a public necessity.

Discussion of the desirable form and authorities of a future "commission" is not pertinent in this report. What is germane is the assumption made here, which affects several findings that follow, that a "commission" will be continued by the states and the federal government into the indefinite future.

Section 206 of PL 89-4 authorized and directed the preparation of this plan under supervision by the Secretary of the Army, and also directed coordination with the Commission and certain federal Departments and Agencies. The Secretary directed the formation of the Office of Appalachian Studies (APS) under the direction of the Division Engineer, U.S. Army Engineer Division, Ohio River, and of a coordinating committee (the WDCCA). Both will close down with submission of this plan, which recommends continuing activities, studies, and project design and construction by a large number of federal and state agencies. Chapter 8 has detailed the responsibilities of individual

[2] Senate Report No. 91-291, 3 July 1969 on S. 1072, "Regional Economic Development Legislation."

political entities, and federal and state agencies, with respect to the implementation of specific aspects of the plan. The States, in Chapter 9, also propose continuing coordinating and planning efforts and arrangements. The question here is of central management, monitoring and direction, which could be continued under the broad supervision of a "permanent commission", with technical review by the staff of the Division Engineer, U.S. Army Engineer Division, Ohio River, under the authority of the Senate Public Works Committee Resolution of December 15, 1967. [3] Appropriate coordination with those now represented on the WDCCA would, of course, be maintained.

6. CONCLUSIONS:

It is concluded that:

- a. The proposed plan is responsive to the specified purposes of the Appalachian Regional Development Act, and will assist the region in meeting its special problems by promoting economic development within a joint Federal-State framework.
- b. The potential for economic development has been analyzed, and a flexible plan has been designed to encourage and sustain economic growth and development through meeting the long-range water resource needs of the Region.
- c. Specific water and related resource investments have been identified in the plan which, when fully implemented in conjunction with appropriate associated investments, will greatly further economic and social goals.
- d. The sub-regional plans, and necessary continuing and future studies specifically identified in this report, provide a suitable framework for continuing cooperative relationships in future planning of water resources for Appalachian economic development.
- e. The projects and the related resources investments recommended for early implementation, plus the projects that may stem from the early time frame studies recommended, will satisfy the near-future needs that have been identified for the development of Appalachia. The projects so far proposed are fully compatible, integral, and harmonious with the Appalachian Regional Development Program, the long-range plans for the sub-regions of Appalachia, with existing comprehensive river basin plans within the region, and with any foreseen subsequent plans that may be developed.
- f. The general approach and methodology for plan formulation and economic evaluation as undertaken in this survey, with the full cooperation of Federal, State, and local agencies, emphasizes that the coordinated development of water resources, in concert with other public service and private investment programs, contributes effectively toward meeting objectives of regional economic development by increasing employment opportunities and enhancing the environment.
- g. The organizational, institutional, and administrative arrangements utilized in this study have proven to be highly satisfactory and have led to a better understanding of the decisive role

[3] "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby requested to review pertinent reports on all streams in the Appalachian Region, as defined in Section 403 of the Appalachian Regional Development Act of 1965, as amended; said reports having been made in accordance with the recommendations of the Chief of Engineers in House Document Numbered 308, Sixty-ninth Congress, and other pertinent reports, with a view to continuing cooperation with the Appalachian States and the Appalachian Regional Commission in conducting water resource studies required to formulate plans for water and related resources development, in keeping with the objectives of that Act and in supplementation of the planning effort initiated and soon to be completed under the provisions of Section 206 of that Act."

of the States and other non-Federal agencies in the planning process.

h. Additional research is needed to develop techniques for: (1) formulating multiple-objective water resource plans; (2) assessing the adverse as well as beneficial effects to the region and the nation resulting from their implementation; and (3) developing the appropriate indices of performance responsive to each of these effects.

i. Realization of the potential benefits from any plan for economic development will be dependent on the resources and ability of non-Federal interests to attract private investments to the area; in the long run, success or failure depends on existing community attitudes, and desires to accommodate to change.

j. Continuous and vigorous action by Federal and non-Federal agencies, separately and cooperatively, under authorities that exist or may be provided, will be needed to fully implement

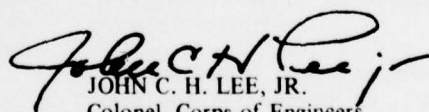
the water resource and developmental elements of the plan.

k. In estimating the expansion effects of water resources projects, it is necessary and appropriate to determine and evaluate the associated public and private development costs, as has been done in this report.

l. It is appropriate, under the provisions of the Appalachian Regional Development Act, to, in some instances, reduce the amounts to be repaid by non-Federal interests.

m. Cost sharing, as set forth herein, is appropriate and conforms generally with existing water resource practice and policy. The report permits initial Federal financing of lands, easements and rights-of-way for local protection projects which are normally provided by non-Federal interests, to be repaid over a 50-year period, as is provided by law for reimbursable functions such as water supply and recreation.

Cincinnati, Ohio
31 December 1969


JOHN C. H. LEE, JR.
Colonel, Corps of Engineers
Director